JULY 13, 1959

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R ESEARCH and news issue D EVELOPMENT

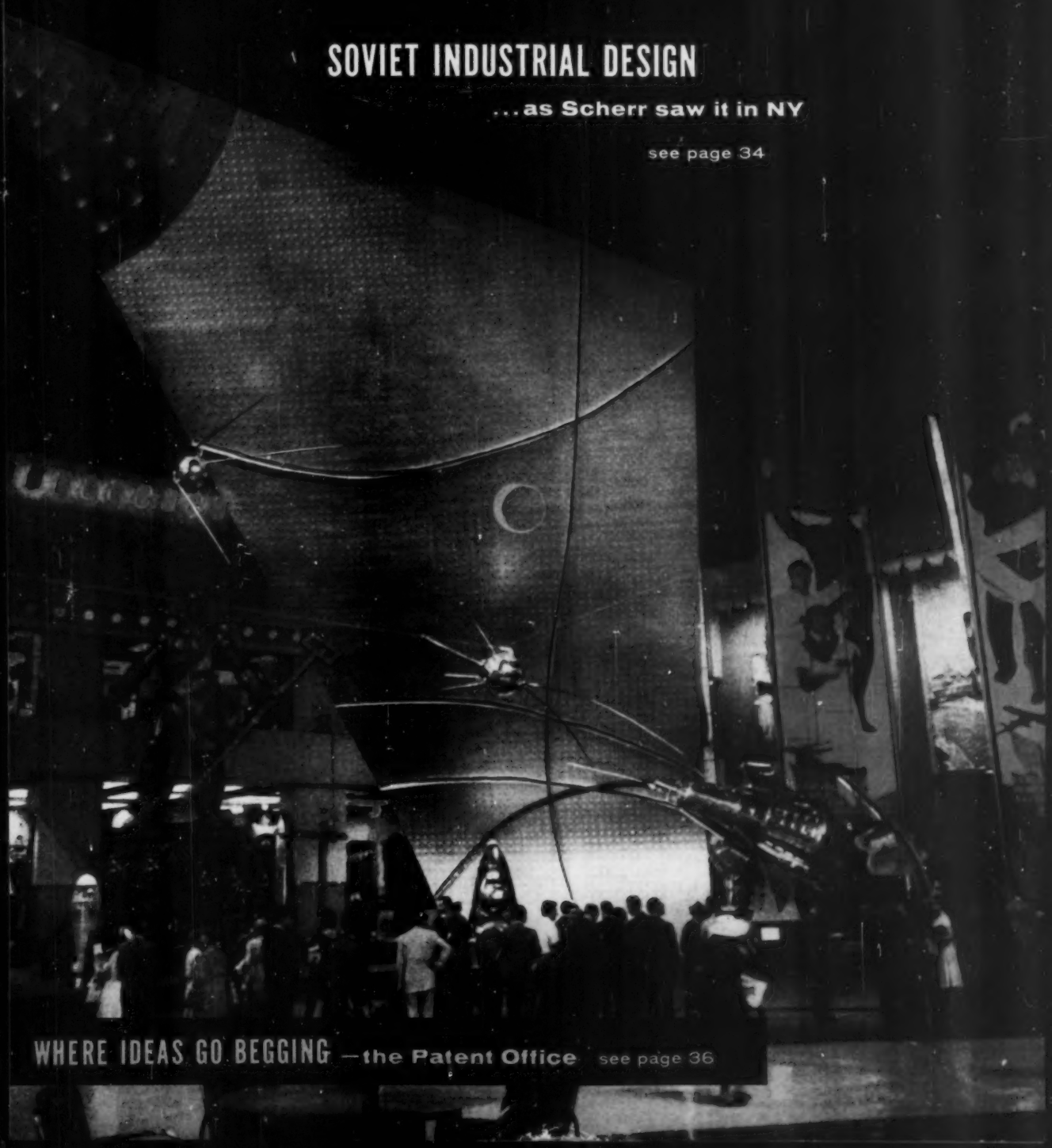
Product Engineering

McGRAW-HILL WEEKLY OF DESIGN, RESEARCH AND DEVELOPMENT

SOVIET INDUSTRIAL DESIGN

...as Scherr saw it in NY

see page 34



WHERE IDEAS GO BEGGING —the Patent Office

see page 36

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- A microfilm projector for sheet music
- Printed-in-the-home newspaper
- A method of tapping atmospheric electrical potential
- A direct light-to-magnetism converter
- A solid-state centrifugal switch

These are just a few of the inventions suggested by our readers in our "Why Don't They R&D" column.

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Do you have similar problems associated with your projects?

To inspire inventors and stimulate the exchange of ideas, Product Engineering invites you to trade such problems (and their solutions) with fellow readers who may have a fresh viewpoint. We will pay $10 for each accepted idea.

Address your letters to:
Why Don't They Editor
Product Engineering
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New York 36, NY

coming next week

the DESIGN issue for July 20

FEATURING

- **Acoustoelasticity makes debut**
  Ultrasonics creates an important new stress-analysis technique.

- **Tight tolerances can be even tighter**
  Design critical dimensions so investment castings can be used "as is."

- **Filament-winding grows up**
  High-speed method of reinforcing plastics is ready for more work.

- **Pressure losses in branch fittings**
  For hydraulics, design-curves give losses at take-offs from mainline.

- **Finds equations in scattered data**
  Regression analysis—what it is, and how this statistical tool works.

- **29 blind-side fasteners**
  They allow mechanical joints to be made from one side of the assembly.

Product Engineering

McGRAW-HILL WEEKLY OF DESIGN, RESEARCH AND DEVELOPMENT

R&D news issue

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●**The Soviet exhibition** (p 34) opened at the Coliseum in New York on June 30, and thousands of us have been crowding in to see what we could of real, live Soviet people—their customs and technology. Next week's Design issue will carry a full-scale report on engineering aspects of the show by PRODUCT ENGINEERING editors, one of whom added these personal impressions, "Ladies rosy-cheeked and plump; men thinner, more intense; accents charming; manners frank; clothes a bit dowdy (suits look hot); exceedingly well-informed about American technology; much less informed about our way of life; made me feel we live luxurious, frivolous lives; made them feel self-sacrificing, stoic. Both wrong."

●**Prominent educators are getting a little annoyed** at the amateur competition (p 40). The woods are suddenly crawling with books, reports, surveys and studies all headed "What's wrong with American education?" A taxpayer at our local PTA meeting a while ago stopped the debate cold with, "If the money spent on all those studies were spent boosting teacher's salaries we wouldn't have needed the studies in the first place."

●**Thermodamnics** is the name given by Professor Sattler of Brooklyn College to certain phenomena familiar to all lecturers in chemistry. He is quoted in the *Saturday Review*, "I have seen barium sulfate refuse to precipitate, flashlight powder remain sullenly inert, aluminum refuse to dissolve in hydrochloric acid . . ." Of course, this is just another name for Finagle's Laws (see PE—Apr 21 '58, p 32). Remember the First Law? "If anything can go wrong with an experiment, it will."

July 13, 1959

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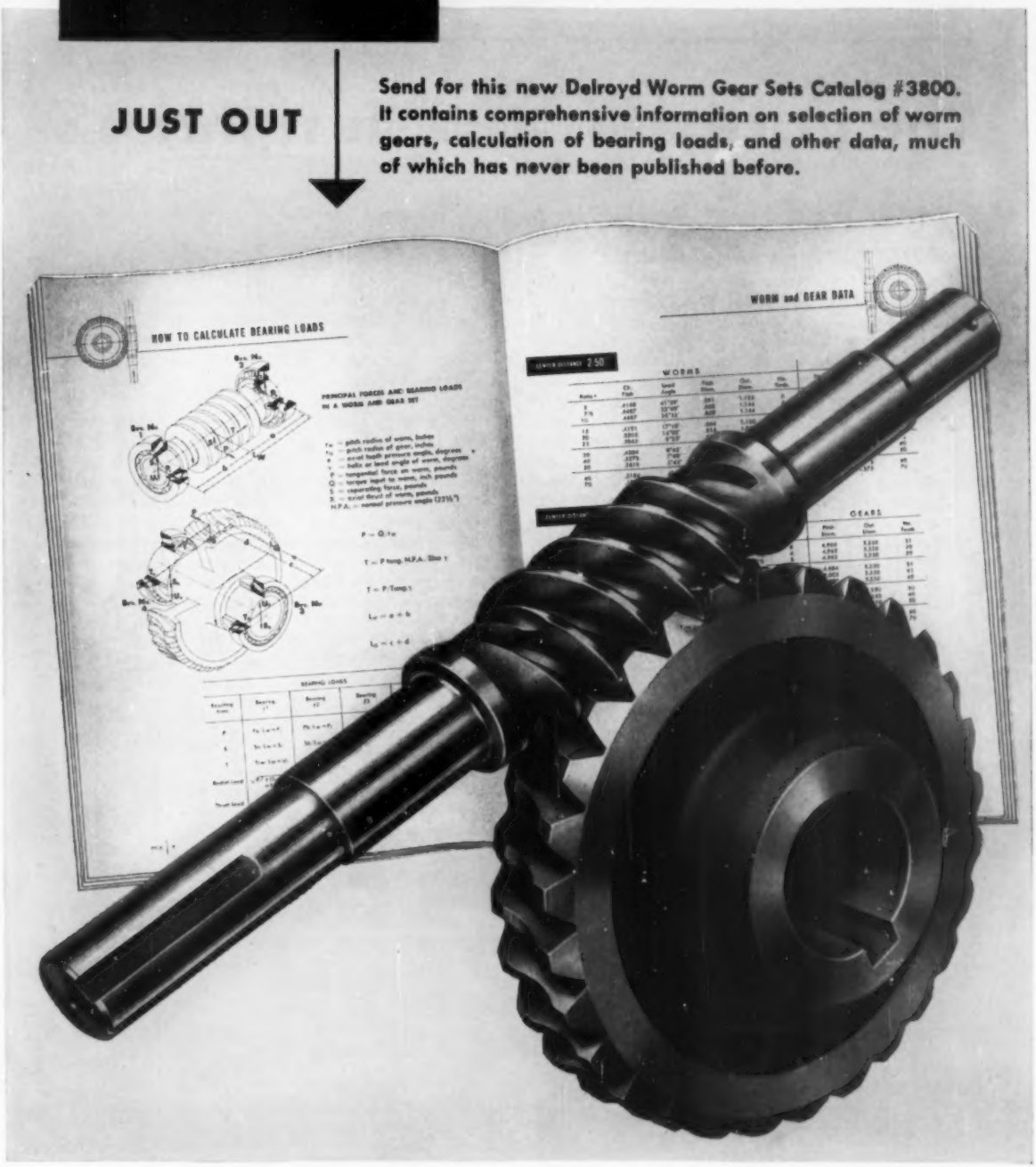

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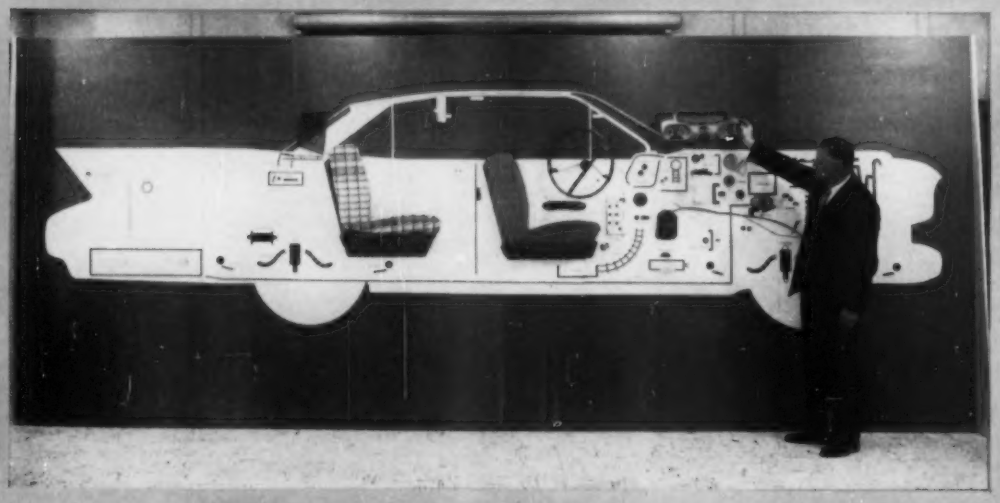
Like all new plastics, Pro-fax, Hercules polypropylene, found its early uses in jobs where its unique combination of properties served a special need. Thus uses requiring the outstanding heat resistance of Pro-fax, or its excellent mechanical and chemical properties were among the first to be developed. But by now the word has gotten around: the properties of Pro-fax are only part of the story. Its present price, coupled with a low specific gravity that spells many additional pieces per pound of material, *makes Pro-fax today's biggest bargain in thermoplastics!* Plastics producers in a broad list of markets are finding they can save real money in both resin and processing costs—and at the same time obtain a superior product—by converting to Pro-fax.

Quick to get on the Pro-fax bandwagon have been the large volume producers who supply the auto industry and the appliance markets. Here, where even small savings can add up to big money, Pro-fax has proved itself a truly structural plastic, able to perform well, and at low cost, in a variety of functional uses. On the other hand, the design possibilities of Pro-fax loom large in the thinking of manufacturers of housewares, toys and packaging. Here Pro-fax is now being used in growing volume in products formerly made of wood, metal or glass, to yield better-looking, fast-selling, quality merchandise. And again, the price is right . . . to producer and consumer alike. Take, for example, all the handsome new Pro-fax products shown here.



Right for automotive uses!

Auto builders are switching to Pro-fax for many key uses. This full scale diagram of a modern car shows the location of more than 100 parts made of Hi-fax®, high-density polyethylene, Pro-fax or Penton® chlorinated polyether. Parts now in commercial use or evaluation are mounted in their approximate location on the chart. Projected parts are shown schematically. Call or write for complete information on the use of Hercules plastics in this growing market.

***Right* at home outdoors!** Pro-fax is perfect for housewares, particularly picnic and casual furnishings designed for outdoor use. These handsomely styled dishes, called *Tranquilware* are available in four attractive colors, with a lustrous, durable finish that is completely stainproof, virtually unbreakable, and immune to the detergents and heats of modern home dishwashers. Pro-fax monofilaments used on the outdoor furniture shown in the background are fadeproof and sag-resistant, lightweight, durable, and can't be stained by food or cosmetics.

Tranquil Dinnerware manufactured and sold by Byrd Plastics, Erie, Pennsylvania.

The "Right Touch" in packaging!

Pro-fax packages glamour to perfection in this striking new aerosol container for Coty Spray Cologne. Called *Petite Mist*, it's available in four enchanting fragrances in a choice of two eye-catching color combinations—either jet black or snow white, each richly decorated with gold. Only pennies' worth of Pro-fax, economically formed into this shapely yet functional package, add up dollars' worth of consumer value and merchandising appeal.

Two-piece aerosol package molded by Pyro Plastics, Union, New Jersey.

Right . . . light . . . and bright!

Providing outstanding performance and economy in lightweight plastic bottles, Hi-fax is now the standard by which all materials for blown containers are measured. Note the sharp detail of the lettering on this new Hi-fax bottle for Avon Deep Clean Cleansing Cream. It's typical of the dramatic decorative effects possible with this versatile packaging plastic.

Bottles are molded with Hi-fax by Imco Container Corporation, Kansas City, Missouri.

The right fittings for plastic pipe!

Pro-fax solved this tough engineering problem: the development of long-lasting, low-cost fittings for flexible plastic pipe. "Poly-Plus Blue Fittings" now being marketed in a full range of types and sizes by Union Malleable Manufacturing Company in Ashland, Ohio, are as durable as steel or iron, more corrosion-resistant than brass or copper. Lightweight, easy to assemble, and unmatched for serviceability, they extend the usefulness of plastic piping systems, especially when used in combination with new, low-cost Hi-fax pipe.

Puts Silverware in the right place!

This rigid plastic silverware basket for Westinghouse is an attractive new feature in Westinghouse "Roll About" Portable and "Roll Out" Built-In Dishwashers. It's typical of the cost savings combined with product improvement made possible by the use of Pro-fax in modern appliance design. A handsome, sturdy, one-piece unit, highly resistant to heat, staining and corrosion—it can't chip, crack, peel or rust, and is unbreakable. These new baskets, molded by Cleveland Plastics, Cleveland, Ohio, replace parts previously fabricated with metal wire and a plastisol covering, provide greatly increased resistance to wear, with a richly colorful finish impervious to dishwashing chemicals and household greases.

CP59-11

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Reader To Editor...

The following comments are but some received discussing our article, "Science and Politics . . ." June 1, p 28. This article has recently been incorporated in THE CONGRESSIONAL RECORD.

To the Editor:

I would like to point out a couple of factual inaccuracies of modest importance. 1. You said, "The scientific community has, for the first time in history, direct access to the executive branch . . ." That's quite a statement, considering the size of the executive branch. Dr Killian is the first scientific adviser to the President—except in wartime. Dr V Bush was an adviser to President Roosevelt during part of World War II. 2. "Outside experts [have been brought in] as consultants forming a panel of from one to five or six members." The total size of the great majority of our panels is between five and fifteen members. 3. "This, and the fact that the Council has no policy-making or jurisdictional powers, has resulted in a 'ho-hum, another committee' attitude among many interested persons, particularly the sponsors of S.676. It has resulted in keen disappointment, too, among government career scientists who half-hoped their hour had come." Two comments about this: The FCST has a duty to recommend policy—and this certainly includes "over-all" policy—to the President, who makes the policy; and the FCST has a standing committee of career scientists and its panels, in distinction to those of the Science Advisory Committee, are made up of career scientists in government.

—Robert M Briber
Assistant to the Special Assistant for Science and Technology, The White House

To the Editor:

. . . The article is a very significant and timely one. It discusses questions that are in the minds of many of our scientists now. It will give a much better understanding to the public of the nature and seriousness of those problems.—James M Gavin
Executive vice-president
Arthur D Little Inc

To the Editor:

. . . The article strengthens an impression which I already had that the coming debate on a Department of Science may revolve about the Berkner proposal to even greater extent than it will around straight centralization of administration of the type proposed in S. 676. The problem to which Dr Berkner addresses himself is not new. Even before the Civil War the Smithsonian Institution acted as an umbrella for agencies of great importance to science and the public which had not direct relevance to any existing department. The difficulty of finding a proper administrative home for a scientific agency is clearly shown by the wanderings of the Weather Bureau, and Dr Berkner is still looking for a real solution for meteorology.

A large number of scientists will probably feel that Dr Berkner deserves support on both the problem he wishes to solve and on the combination of lines of research he wishes to foster. Before this approval can be coupled to the drive for a Department of Science, however, two questions must be answered. In the first place, is a Department of Science, whose name includes the suggestion that it speaks for all of science on over-all policy, the only way in which a stable organization for these lines of research can be set up? Can they not get the scope they need in an agency below the cabinet level?

In the second place, if such a Department were set up, how could a firm line be drawn between the needs of the research agencies in the department, and those which are equally scientific but left outside the department? If the implication persisted that the Secretary of Science speak for all of science, how could he adjust his relation to meteorology, which would be directly under him, and to plant pathology, which would not be?

It may be that the Hoover-type commission, if it is formed, should look for a satisfactory solution to Dr. Berkner's very real problems in order to save the Department of Science idea from a too restrictive use.

—Dr A Hunter Dupree
Dept of History
University of Calif

To the Editor:

. . . I wish to commend you for the sober and detached way in which you have presented the issue.

—Paul Weiss, *member*
President's Science Advisory Committee

Individual and the Team

To the Editor:

After writing to a number of research directors for opinion and comment on an article I'm writing, "The Chemist as a Product Designer," most have said, "a mere chemist is not qualified to perform such a broad task. Rather, this job takes an unusual chemist with varied talents and very broad viewpoints. However, as a member of an efficient team, a man with such broad qualifications is not required."

There's the point. The individualist shouldn't be on the team. The large company that can afford a large team cannot afford to have all team members broadly trained and qualified. And also, the small company that cannot afford a team must hire and pay for a good highly creative man with these varied talents.

Such men, who probably make up the bulk of the present outcry against excessive teamwork and narrow specialization in industry, should look to the small company as an outlet for their frustrations.

—Harrison McDonald
DeKalb, Ill

DEVELOPMENTS TO WATCH...

American

Improved electrical properties and moisture resistance for nylon...

. . . and greater impact strength for polystyrene are among the advantages expected from new blends of these two materials with each other and with other resins.

One such combination—nylon and polyethylene—is already under test by molders. Others are being studied both here and abroad. Foster Grant Co, for instance, plans a major research program on nylon-polystyrene blends. Dr. Raymond Hartigan, FG research director, believes the high-polystyrene combinations are particularly promising from the point of view of performance as well as cost. Look for more news of this program—from this and other sources—within the next 12 months.

Polymers with long-time stability at 1000 F . . .

. . . are being developed under Wright Air Development Center sponsorship. This is a long-term project, and progress has been slower than WADC had hoped. However, recent reports are encouraging. Among the inorganic and semi-organic polymers that show promise as structural materials are boron, silicon, and aluminum-oxygen compounds. Boron-phosphorus and boron-nitrogen compounds may also prove useful as high-temperature lubricants or adhesives, and several other possibilities are being explored. (Note: For more on high-temperature polymers, see p 11).

Miniature lamps, less than 0.1 in. long and 0.030 in. dia . . .

. . . developed by Diamond Ordnance Fuze Laboratories, are now headed for commercial production. These "microlamps" are said to "provide a very small, bright source of illumination" when operating at 1½ v and 30 milliamp; and a light "sufficiently bright to be seen from any point in a normally lighted room" when operating at 1 v and 25 milliamp. They can be turned on and off at frequencies up to 100 cps, are expected to have "very long" lifetimes, and their small size makes them highly resistant to breakage. Preliminary tests, involving a 6-ft drop, showed "no noticeable change."

At present, the lamps are being built only on a very limited, laboratory basis. No samples are available. But production facilities are being set up, and Diamond Ordnance hopes that at least sample quantities will be coming from the commercial source in the near future.

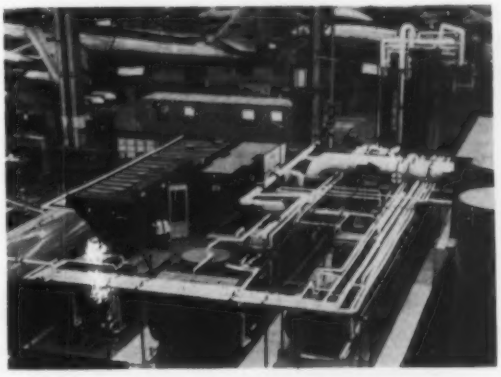
Packaged "portable" nuclear reactors are being offered for sale . . .

. . . and, if there are takers, they could pave the way for near-mass production of such components as pumps, valves, and electrical controls.

The first such reactor, built by Alco Products for the Army, has been in operation at Ft. Belvoir, Va, for quite some time, and a second one is being developed. Meanwhile, AEC has invited and received nine proposals for a nuclear power plant built of "factory-assembled modules or units which can be air-transported to a remote site and rapidly connected." This would be rated at 8 to 10 thermal megawatts; would produce 1000 kw of electricity and 7 million btu of space heat (200 tkw) an hour.

Now, Lockheed has come up with the design pictured here, and is ready to build one to order. Lockheed says it could provide enough power for "4 medium-sized manufacturing plants or a town of 2000 homes." It could, says Lockheed, be in operation 90 days after delivery to a prepared site.

—ARG



Sixteen planes could deliver a nuclear power plant like this anywhere in the world in a day and a half, says Lockheed Aircraft. Individual sections are all within the size and weight limitations of the company's 60-ton Hercules airfreighters, like those puled up behind the model.

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World-wide

Improved insulating varnish for small motors . . .

. . . is claimed by Beck & Co, Eiselensweg, Hamburg 28, W Ger. It's a synthetic oil said to have passed "stringent tests which have included centrifugal effects" at temperatures to 270 F; and to show good penetration (vacuum impregnation is unnecessary) and an elasticity "adequate even for tightly packed windings." Curing time is approximately four hours, at stepped temperatures from 230 F to 320 F. Besides applications in small motors for portable electrical drills and home appliances, it's expected to prove useful for larger motors and for "high-tension electrical machines and apparatus."

New metallo-ceramic polymers for very-high temperature . . .

. . . may stem from a radiation-polymerization technique developed by Union Carbide. An Australian patent application reveals that, by exposing "a mixture of one or more metalloid oxides, silicic acid, and an organic hydroxy compound" to high-level nuclear radiation (100 to 400 roentgen/gm) until a solution is formed, then polymerizing that solution, it is possible to produce resins of unusual types.

Taking their cue from the driverless industrial trucks . . .

. . . manufacturers in companies as far apart as Sweden and Japan are readying remote-controlled "automatic" equipment, for applications as diverse as logging and golf.

From Japan comes news of an "automatic caddie" that "looks like a baby carriage" and is operated by a portable, pocket-sized transmitter which the golfer carries. According to the Japan Export Trade Center, the transmitter is 8 x 2.4 x 1.6 in. and has 5 buttons to control forward, reverse and lateral motion. The caddie itself is said to be able to carry two persons, climb a 30° incline and stop itself (via a sensing device on the front bumper) if it meets an obstruction. The price: Just $200, f.o.b. Japan. The manufacturer: Koden Seisakusho.

The Swedish device has a transmitter which can be strapped to the back of the operator (it's about 6 x 10 x 3 in.); and a receiving unit controlling an engine-driven winch equipped with a grapple and cable or yarding sled and cable. "Once the logs have been fixed in the grapple or lashed to the sled," says Sepson AB, Vunsbro, Sweden, " all operations can be controlled by radio from any distance up to 1600 ft," and logs can be dragged at least 400 ft.

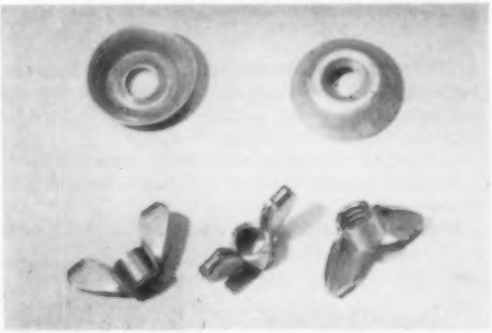
Britain is joining the parade too. H C Webb & Co of Birmingham, and Atton Development Ltd of Surrey have developed a remote-controlled lawnmower, operated by a 2-switch miniature radio transmitter, which they hope to have on the market next year. The mower itself has a ½ hp, 24-v, battery-operated motor; will take "60 clips to the yard."

Wingnut made of sheetmetal . . .

. . . is designed to fit into a cupped recess in the part being fastened, though separate washers can be furnished, as shown.

By choosing the thread on the nut so it is slightly different in pitch from that on the bolt, the designer says, it is possible to make the nut exert a continuous locking action.

The same company, M F Robertshaw Ltd, Bletchley, Buckinghamshire, Eng., is working on several variations of the design, for use as inserts in molded plastics, and for other applications. The basic unit, the company says, can be produced in quantity at prices "generally below that of the orthodox type." For lots of 20,000, for instance, the price of the nut pictured in the ¼-in. size would be about 70¢/100. —ARG

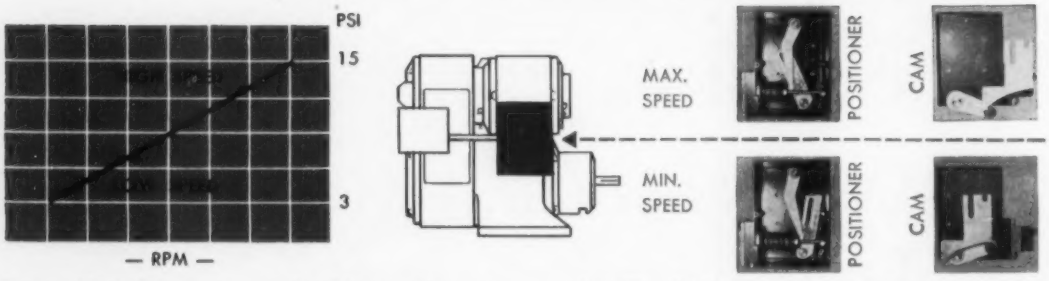


Whitworth-type wingnuts are made by folding pressed metal sheet. Normally, part to be fastened carries washer shape—no need for the separate washers.

REEVES AIRtrol

AUTOMATIC PROCESS CONTROL
with
Vari-Speed Motodrives

Sensitive Speed Reaction to Controller Signals ... Straight Line Variable Speed Output



• REEVES AIRtrol, in an open or closed loop system, automatically and continuously corrects operating speeds to compensate for variations in materials or energy (i.e. temperature, liquid level, density or flow).

As the final control element, the pneumatically-controlled Motodrive assures sensitive and stable control throughout the speed range.

Linear speed output is a result of the exclusive cam design. The AIRtrol responds to a 3 to 15 p.s.i. pneumatic signal, and is adaptable to all standard process instrumentation.

The AIRtrol is available on all REEVES Motodrives . . . hundreds of assemblies from ¼ through 40 hp., 2:1 through 10:1 speed range, and 1.7 through 4660 rpm.

For examples of AIRtrol in process control systems, write Dept. K 39a for AIRtrol Instrumentation Data Sheets.

VARI-SPEED MOTODRIVE
VARI-SPEED MOTOR PULLEY
VARIABLE SPEED TRANSMISSION

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WHAT'S HAPPENING IN... Science

Who says impossible?

Eight things "science tells us we cannot do" are listed by Dr Howard A. Wilcox, deputy director, Defense Research & Engineering. Fortunately, a lot of engineers and scientists won't take "impossible" for an answer. At least one item on the list, anti-gravity, is already the subject of intensive research (*PE—Dec* 30, '57, p 12), and several of the others might well form the basis for long-range R&D programs.

The list? Says Wilcox: "We do not think . . .

. . . an anti-gravity screen can be developed. This conclusion is based on a very wide variety of experiments and is sanctified in Einstein's theory of gravitation."

. . . energy can be created except by the vanishing of proportionate quantities of mass in accordance with Einstein's famous formula $E = MC^2$. Energy and mass taken together in proper ratio represent a fixed and constant total in our locality of the galaxy, most scientists believe.

. . . useful work can be gotten from any very large fraction of the vast quantity of heat energy in the oceans. This negative conclusion comes from the second law of thermodynamics, discovered 109 years ago, and is "guaranteed" by the statistical laws governing the behavior of large numbers of atoms and molecules.

. . . the simultaneous measurement of the position and velocity of a particle of matter can be reduced in uncertainty below a definite known numerical value. This impossibility was enunciated by Heisenberg, in 1927, and is supported by a vast range of careful experiments. Unfortunately, this irreducible amount of uncertainty is so small in magnitude that it promises us no practical limitation of the aiming accuracy of an intercontinental ballistic missile.

. . . one can compress more than a definite maximum amount of information into a given time-bandwidth for a given communication channel.

. . . an experiment can be performed which measures the absolute speed of the earth relative to any postulated absolute space. Einstein made this limiting statement a cornerstone of his celebrated theory of relativity in 1905.

. . . an H G Wells-type time-travelling machine can be developed. Newton and Einstein both rule it out.

. . . any actual material body can ever be developed that will remain structurally solid if its average temperature rises above a few thousand degrees Fahrenheit.

Harnessing the H-Bomb, Russian Style

Thermonuclear research, aimed at "peaceful" uses of nuclear fusion, is emphasized by this model being displayed at the Soviet Exhibition, now in progress at New York's Coliseum. It's a plasma ring device, similar to our Stellarator and the British Sceptre (*PE—Apr 7 '58, p 12, and May 4 '59, p 32*), and designed to accelerate nuclear particles to ultrahigh speeds and temperatures. The Russians call it a *Zhanro*. (Note: for more news of this exhibition, see p 34.)

What ultrasonics can do—and can't

With high-powered sound waves already proving their value in grinding, mixing, sifting, level-gaging, soldering, welding and parts-cleaning; and with home laundry devices and a host of special-purpose industrial machines being readied for introduction, it may begin to look as though ultrasonics can do "anything."

A caution signal in at least one direction, though, is sounded by Whirlpool Corp and Battelle Memorial Institute.

It comes from a study of the possible use of high-frequency sound waves in thawing and defrosting.

It had been suggested that the feature which limited the desirability of electronic cooking—heating from the inside out, resulting in the well-done, unbrowned steak—might make a system of this type particularly helpful in defrosting.

Such did not turn out to be the case. When ultrasonic radiation was applied to solid foods, the high-frequency waves were found to start work at the surface, thawing it by reflection as well as dispersion. Then, heat generated in the thawed material caused local hot spots, while leaving the center still frozen. This is because the thermal conductivity of solid food is low and the softer, thawed material absorbs more energy than frozen food.

Liquid foods did thaw rapidly when exposed to ultrasonic radiation, by virtue of heat conduction from the liquid-food interface. But, again, the liquid phase absorbs most of the energy, so that over-all energy requirements are high.

Result: the Whirlpool-BMI group concluded that, at the present stage of development, this particular application does not appear commercially feasible.

Atom brief . . .

Atomic industry directory that lists materials and component suppliers, engineers, and reactor builders, has been prepared by Atomic Industrial Forum. A 130-page, printed, paper-bound, 6-by-9 booklet, it classifies companies by product and service (from "Accelerates—high energy to "Valves"), tells what each company offers, and gives name of individual to whom inquiries should be addressed. Price(to nonmembers): $2.50. —ARG

WHAT'S HAPPENING IN... Materials

Steel: major switch coming?

"For the first time since early in the century, there is a chance that the US this year will be a net importer of steel products." That prediction comes from economists at Bankers Trust Co, and the facts thus far seem to bear it out.

Monthly imports have been running more than 100,000 tons over exports. A year ago, the situation was exactly the reverse; and five years ago, steel exports were nearly 5 times steel imports.

The total amount of steel concerned is not large compared to total production—less than 4%—but it is still significant. Furthermore, while inventory buildups in fear of a steel strike undoubtedly contributed to the increase in imports, this does not seem to be the whole story.

Where is the steel coming from and going to? Biggest import source has been the Benelux group, but Japan is coming up very fast. Our biggest customer by far is Canada. Second—though taking less than a quarter as much—is Venezuela. The European countries each take about half to ¼ as much as that—2,000 to 26,000 tons.

One interesting sidelight: Though imports top exports on a tonnage basis, in dollars we're still ahead. Our imports have cost us about $100 million; while our exports have brought in more than $150 million. The difference stems from higher prices and a different product mix.

Putting the new ones to work

Progress in fabricating the newer metals is proudly claimed by several companies this month. There are encouraging reports on research too.

• In regard to **beryllium**, for instance, a survey by Battelle Memorial Institute for the Defense Metals Information Center indicates several new approaches to the problem of bonding this metal to itself and to other materials.

Brazing, using silver-base alloys, has been most successful thus far. However, other methods look interesting, on a laboratory basis at least. Among them: tungsten arc welding, solid-state (pressure) welding, and the newer electron beam welding methods (*PE—Mar 23, p 7*). In each case, special precautions are needed because of beryllium's brittleness.

Resistance welding and ultrasonic techniques are also under investigation, as is adhesive bonding. Tests have been made with epoxy resins, but work in this area is just beginning.

Meanwhile, from Johnston & Funk Metallurgical Corp. comes word that wire as fine as 0.090 in. from 0.250 in. has been drawn from hot-pressed Brush Beryllium rod, using standard wire-drawing equipment, and a special preheat furnace. Results here are said to be good. (Note: for other news of beryllium, see *PE—June 22, p 39*).

• **Columbium** is literally forging ahead. The Tapco group of Thompson Ramo Wooldridge claims "the first forged jet engine turbine blades ever made from a columbium alloy." The alloy itself is a special one, developed by TRW and DuPont; and special lubricants were developed for the job. Argon atmospheres were used for heating.

• **Titanium** parts are getting bigger and bigger. American Welding & Mfg is making rings more than 74 in. in dia and 2.875 in. thick, and holding them to plus or minus 0.010 in. in fabrication. American Welding thinks they're the biggest thus far made.

(Note: for design data on these metals, see *PE—Mar 17, '58, p 66*).

brief . . .

Nickel-free stainless shows excellent creep-rupture properties at elevated temperature—comparable to Type 347 at 1350 F, and considerably better than Type 304—says US Steel. Its metallurgists believe USS Tenelor nickel-free austenitic stainless, would be suitable for use as an 18-8 replacement in times of emergency.—ARG

How hard is "soft?"

An instrument that measures penetration hardness and resiliency and checks effectiveness of cure on such film and coating materials as vinyl plastisols, is being made available commercially by Thwing-Albert Instrument Co, Philadelphia.

Developed by Continental Can's Research Lab, the instrument combines a Vicat-type penetration needle, a regulated power supply for the needle-motion transducer, and a strip-chart recorder. Price is $1950.

Primary advantage of the new design, says T-A, is its ability to handle thin materials—less than a mil—as well as relatively thick ones (to ¼ in.); and it can detect variations in hardness resulting from a difference of as little as 15 sec in cure time.

Hardness tester for resinous materials plots penetration and elastic recovery. Power supply is at left; recorder at right.

LINK-BELT IN-LINE HELICAL GEAR SPEED REDUCERS . . .

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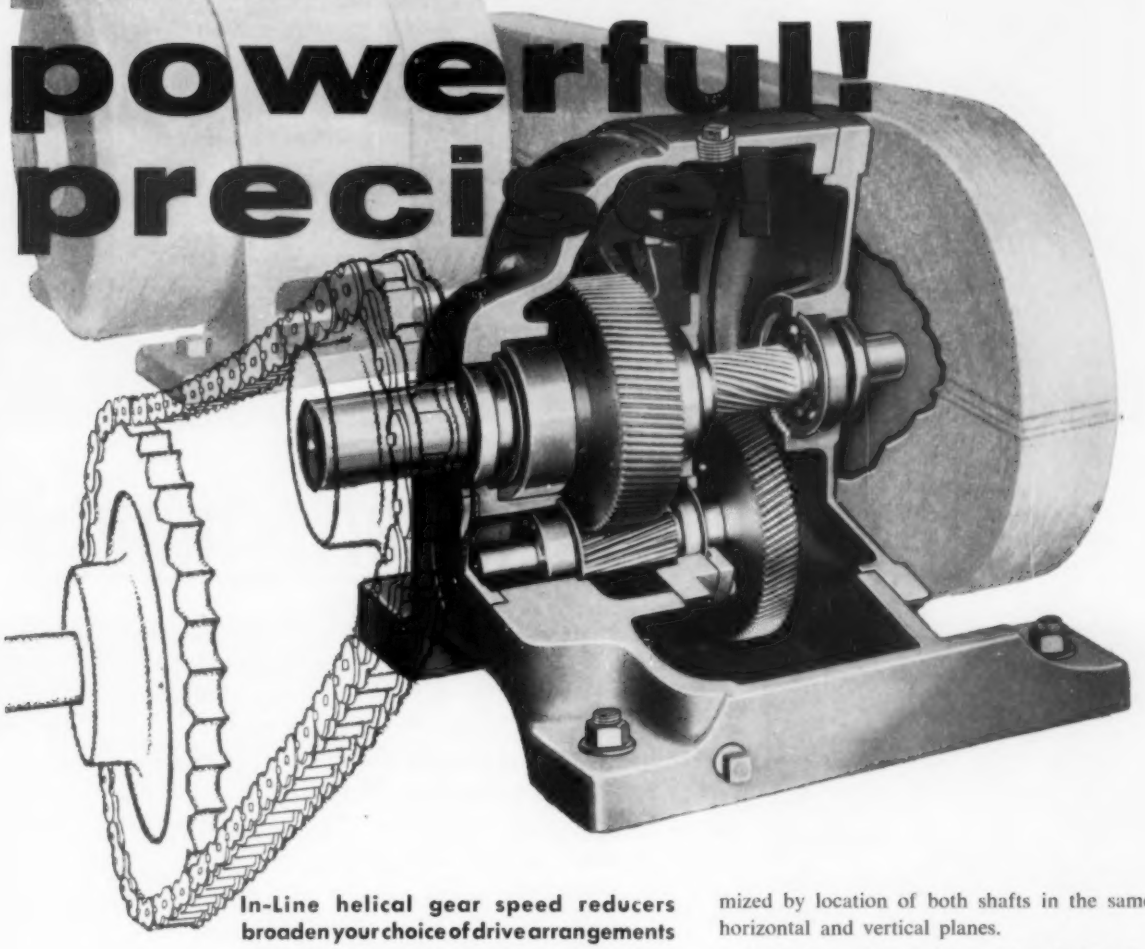

In-Line helical gear speed reducers broaden your choice of drive arrangements

No limit to the number of compact drive set-ups you can arrange with a Link-Belt In-Line helical gear speed reducer. Mount the motor where you will—it needn't be direct-connected. Space demands and layout problems are minimized by location of both shafts in the same horizontal and vertical planes.

Built for hard work, these drives feature the simplest of gear arrangements. Housing is one piece—sturdy and well sealed. Stocked in double, triple and quadruple reductions—up to 206 hp, ratios to 2217:1.

FOR FULL-LINE FACTS

on Link-Belt's comprehensive line of speed reducers—contact your nearest Link-Belt office . . . or check and send this coupon to Link-Belt Company for data on all or any combination of the following:

- ☐ gearmotors—Catalog 2747
- ☐ motogears—Catalog 2747
- ☒ In-Line helical gear speed reducers—Catalog 2751
- ☐ shaft-mounted speed reducers—Catalog 2618
- ☐ worm gear speed reducers—Catalog 2324-A
- ☐ universal worm gear speed reducers—Catalog 2724
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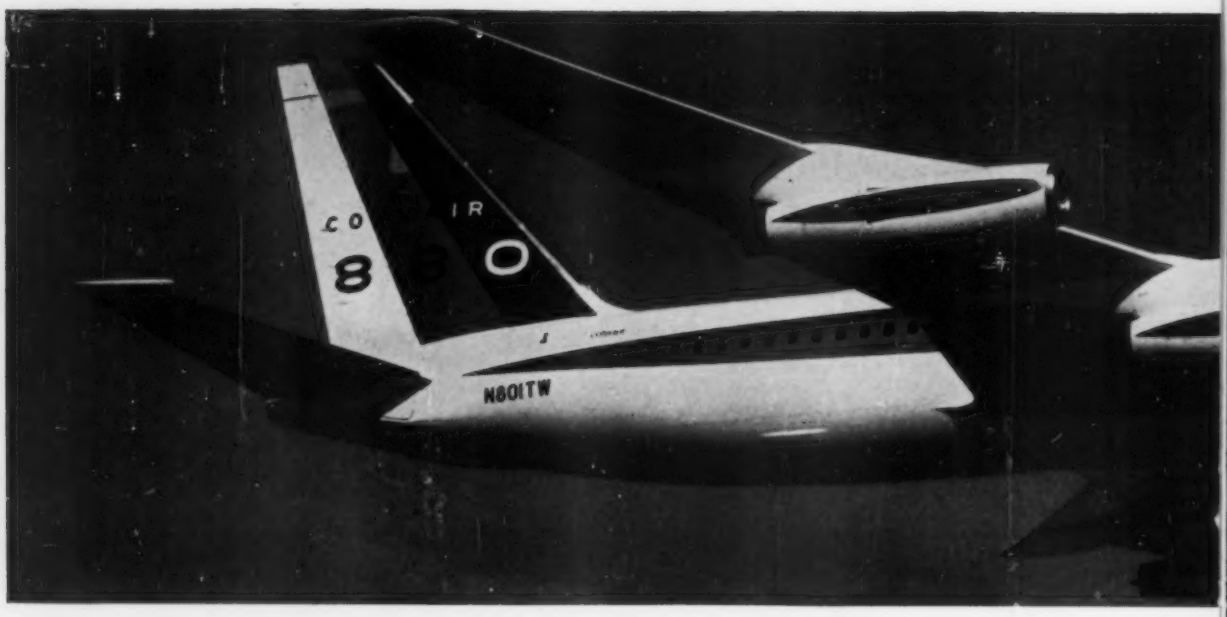


Republic High-Performance

STAINLESS STEEL IS USED IN LEADING EDGES of the 880's vertical fin and horizontal stabilizer where anti-icing is accomplished through electrical heating of the metal. Use of Republic ENDURO Stainless Steel increases strength and heat-resistance, permits thinner, lighter gages. Types 301 and 302 are readily formed into desired shapes by cold-forming, drawing, and bending operations. Mail coupon for complete details.

In the Convair 880—the world's fastest jet airliner—speed, economy, and medium-range operating requirements dictated the use of thousands of pounds of *high-performance* metals. Working closely with design engineers, Republic Steel supplied:

TITANIUM to increase strength-to-weight ratios . . . permit lighter weight with increased strength.

ENDURO® STAINLESS STEEL to increase heat and corrosion-resistance at elevated temperatures.

ALLOY STEEL to increase strength of major structural components . . . provide an extra margin of "beef."

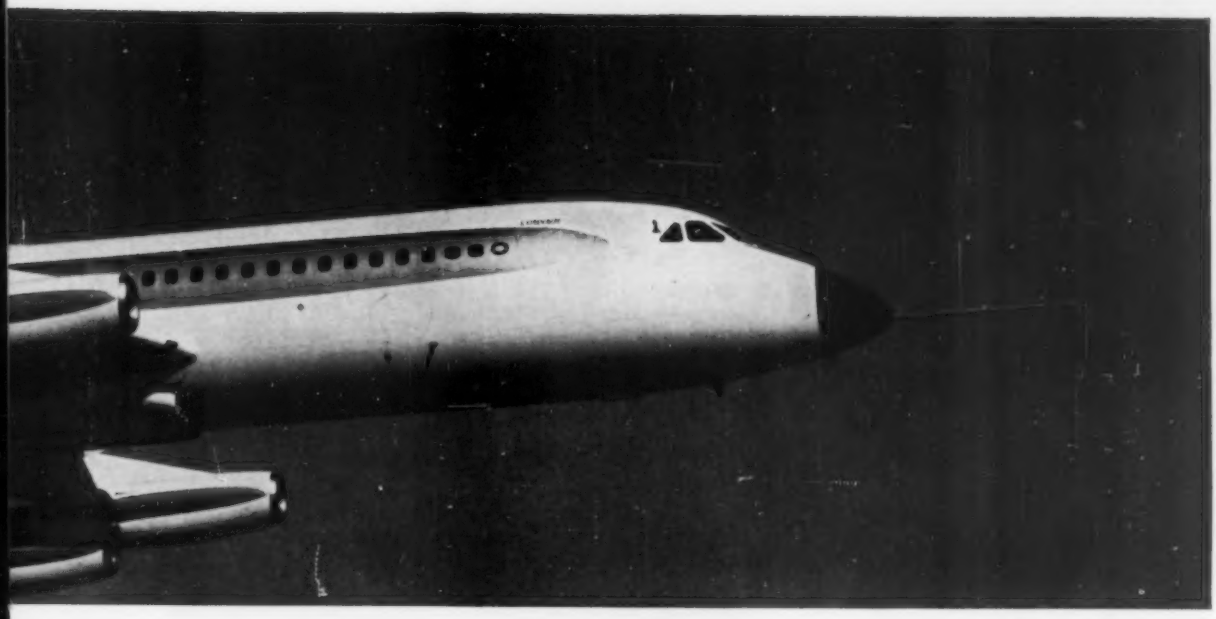
Republic has pioneered in the development and production of new metals to increase strength, resist heat, reduce weight. With constantly expanding research as well as production facilities and capabilities, Republic is the nation's largest producer of *high-performance* metals —titanium, stainless, and alloy steels.

Let us help you find the most advantageous uses of these metals in *your* project. Return the coupon for complete information without obligation. Please indicate if you would like a Republic Metallurgical Specialist to call.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels



Metals for the 880

IN EACH 880 POD-PYLON, rear engine mount "horseshoe" frame — of nickel-plated, chrome-alloy steel — grips the powerful General Electric CJ-805-3 engine. Republic Alloy Steels offer exceptionally high strength-to-weight ratios with the highest strength values. Uniform response to heat treatment assures complete deep hardening penetration, plus hard, wear-resistant surfaces. Send for additional information.

REPUBLIC'S NEW HIGH-STRENGTH POWDER, TYPE HS6460,

is ideal for sinterings of highly stressed components. Provides minimum tensile strength of 60,000 psi at 6.4 density as sintered . . . 100,000 psi after heat treatment. Less than .004% shrinkage from die size at 6.4 density. Available in quantities up to and including 12 tons or multiples. Can be used with existing operating equipment. Mail coupon for technical data sheet.

MAJOR 880 TITANIUM USES are (1) fixed outboard nacelle assembly—107.8 pounds per nacelle, 215.6 pounds per airplane; (2) lip assembly anti-icing nose cowl—53.8 pounds per nacelle, 215.2 pounds per airplane; and (3) right hand access door assembly—41.2 pounds per nacelle, 164.8 pounds per airplane. Republic supplies a major portion of the 870 pounds of titanium that goes into each Convair 880.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. PE -7818
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Have a metallurgist call:	Send more information on:
☐ Alloy Steel	☐ Alloy Steel
☐ Stainless Steel	☐ Stainless Steel
☐ Titanium	☐ Titanium
☐ Type HS6460 Metal Powder	☐ Type HS6460 Metal Powder

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NEW...
from Skinner!

3-way, high-flow, solenoid valves for general industrial use

Main orifice sizes: full effective—⅜", ½", ¾" for ⅜", ½", ¾" NPT.

Standard operating pressures: 5 to 150 psi.

Media: oil, air, water, vegetable and petroleum oils, inert gases, kerosene, gasoline.

Types: normally open, normally closed and directional control in standard and explosion-proof construction.

These new, 3-way L3 Series valves, like all Skinner valves, are built to UL standards. Their bodies are made of forged naval brass and their internal parts are stainless steel and brass. Soft, synthetic inserts and seals provide bubbletight sealing. And a unique, Buna-N coated nylon diaphragm assembly assures long life. The valves are compact, light, and mount in any position, directly to the line. They are offered in a wide range of voltages and frequencies, with many electrical options and manual override.

Typical applications: air vises, chemical process equipment, presses, water treatment equipment, industrial machinery, packaging machinery, air and hydraulic cylinders, laundry machinery, etc.

Skinner solenoid valves are distributed nationally.

For complete information, contact a Skinner Representative listed in the Yellow Pages or write us at Dept. 457.

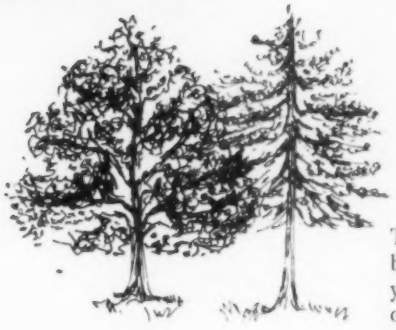
SKINNER ELECTRIC VALVES

THE CREST OF QUALITY **THE SKINNER ELECTRIC VALVE DIVISION • NEW BRITAIN, CONNECTICUT**

Product Engineering

HORIZONS

July 13, 1959



the QUALITY COPYIST

There was once a forest of oak trees that could trace its ancestry straight back to the Charter Oak. The woods covered a fairly wide area through the years, and felt quite important. As the oaks continued to spread, they overawed and overruled first the copper beeches and later the yellow birches that grew around them.

As they grew over a hill, they saw a foreign kind of growth–a forest of pines. Said the oaks: "Now what is this thing that tries to copy us? It doesn't have broad leaves, it has cones instead of acorns, it doesn't drop its leaves in the fall as trees should. It's just a copy of a tree, and everyone will know that's all it is."

But the pines kept spreading. They withstood the winters, their soft wood seemed as good as English (well, English-descent) oak, and the other trees seemed to accept this "imitation" with no qualms. They knew they had all started as nuts of a sort in the first place.

This parallel comes to mind as the chorus of "copy, copy, copy" appears in the popular press and over the air in connection with the USSR Exhibition in New York. There seems to be one sector of the population that must reassure itself by degrading others, that cannot bear to be anything but superior, even if it is in the number of cigarette lighters or the depth of a decolletage.

Of course many Soviet products are copies–the Russians will be the first to say so. They don't put engineering time on repeat projects, and the East places no onus on copying. But these people have put engineering time into developments that set us back on our heels–the sputniks and nuclear energy. Such challenges are at the show too, and very visible, but some of our local critics exhibit snowblindness at times.

Let's face it–the onus on copying is an outmoded Victorian custom. We all copy right and left–or perhaps we call it "research" or "adaptation." But this is smoke screen; man copies man in everything he does. It isn't whether or not you copy that's important–it's how well, and with how much application to your own needs. There's a key point here:

It takes a very competent engineer to adapt an idea or a product successfully.

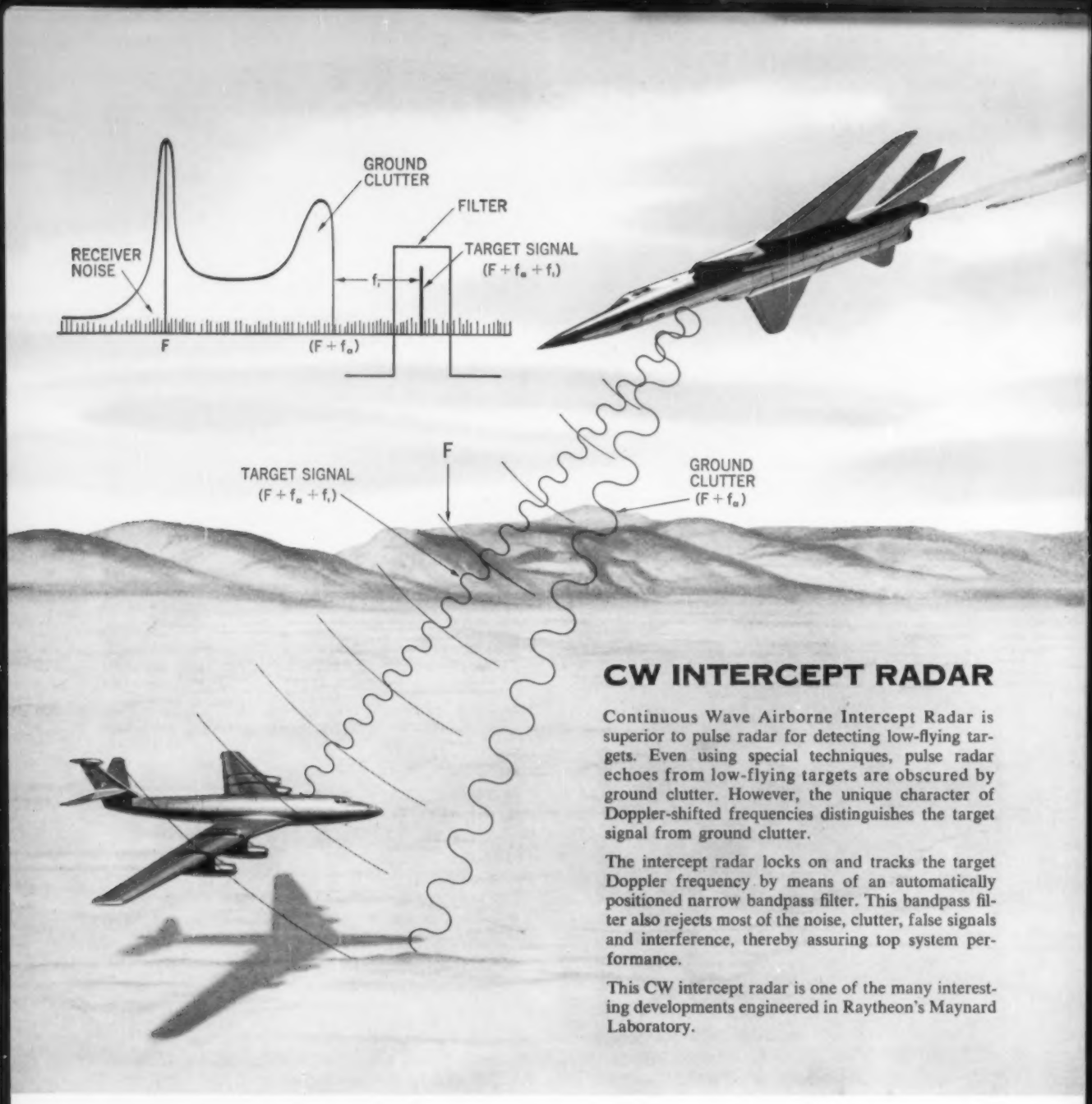
We've done very well with the English turbojet, the German bazooka, and some Swiss mathematics, just to begin the list. The Japanese, Chinese and Russians have done very well in copying and adapting our ideas too.

Meanwhile we all know of the research men who initiate an expensive project and arrive at the same answer they could have found in the literature had they done proper research. And some of the best literature would have been in German, French or Russian, as well as some in the original English.

Somehow, good sense is frequently obscured by pride masquerading as personal initiative, national honor, or professional ethics. The Bible (from the Hebrew by way of Rome) said it quite succinctly:

"Pride goeth before destruction and an haughty spirit before a fall." - *Prov XVI, 18.*

R. T. Langeman



CW INTERCEPT RADAR

Continuous Wave Airborne Intercept Radar is superior to pulse radar for detecting low-flying targets. Even using special techniques, pulse radar echoes from low-flying targets are obscured by ground clutter. However, the unique character of Doppler-shifted frequencies distinguishes the target signal from ground clutter.

The intercept radar locks on and tracks the target Doppler frequency by means of an automatically positioned narrow bandpass filter. This bandpass filter also rejects most of the noise, clutter, false signals and interference, thereby assuring top system performance.

This CW intercept radar is one of the many interesting developments engineered in Raytheon's Maynard Laboratory.

PROFESSIONAL ASSOCIATION WITH A FUTURE

Raytheon has excellent openings for qualified engineers and physical scientists with BS or advanced degrees. Positions are available in systems, development, design or manufacturing engineering of complex electronic equipments. Please write Donald H. Sweet, Government Equipment Division, Raytheon Company, 624 Worcester Rd., Framingham, Mass.

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GOVERNMENT EQUIPMENT DIVISION

LAND SEA AEROSPACE

THE ENGINEERING WEEK

Engineers Lose to Scientists on A-plane

WASHINGTON—Behind the Administration's latest decision to shelve prototype production of a nuclear-powered airplane (*PE*—Nov. 25, '57, p. 107) was a philosophical dispute between the President's scientific advisers and the engineers responsible for the program.

The engineers' view—as represented by the Air Force and AEC Chairman McCone—is to build a prototype plane, get it up in the air as soon as possible, and test out what has already been developed, even though a primitive design capable of only limited performance. They are willing to settle with what they have and proceed on a step-by-step method of development.

The scientists' view—as represented by the President's Scientific Advisory Committee, headed until recently by Dr. Killian—is to hold off on prototype construction as long as significant improvements in technology and design appear attainable.

Obviously, the view of the scientists has won out, supported by these factors: (1) skepticism of some top-level administration officials over the value of a nuclear plane and (2) concern by the conservative budget-planners over costs.

McCone's sympathetic attitude represents a significant change in the AEC top echelon's view on prototype construction. McCone was supported by a second commission member; however, a third member still doesn't look too favorably on the program. He's worried about the safety angle of such an operation.

Actually, AEC's role in a flight program is overshadowed by the Pentagon's. The Defense Dept's director of research and engineering, Dr. Herbert York, overruled the Air Force proponents. But some congressional observers feel that York was "not entirely a free agent on this." They believe the latest decision came essentially from the White House, although York himself revealed it to the congressional committee.

Despite its decision, the Administration has decided to reorient the development program, placing the stress on "advanced concepts" in both the GE direct air open-cycle and the Pratt & Whitney indirect closed cycle projects. In essence, this means an emphasis on development of new materials capable of higher performance than materials used in present designs.

Critics of the decision—notably, Rep Mel Price—say that, in effect, the administration is scrapping the bulk of the powerplant development work done to date and is starting from scratch. He claims the decision will put back the program two years.

The plan is to continue the program at a stable $150-million annual level in the immediate future. Construction of a prototype plane would have boosted costs by some $300 million over the next four years.

Price has now decided to go ahead with his long-planned open hearings on the over-all program. The hearings are set for later this month. He says his objective is to "bring the whole sorry history of the (nuclear aircraft) program into a public forum." This will be the first public congressional hearing on the program. ■

Electrostatic Printing Process Outspeeds Computers

CHICAGO—A high-speed electronic process capable of translating binary pulses directly from a computer or magnetic tape, then printing or displaying the resulting information at a rate of 20,000 numbers, letters or symbols per second, has been developed by A B Dick Co. Its ability to utilize computer-generated information as quickly as it's made available puts the process far ahead of existing printing devices. It will have wide commercial as well as military applications.

Called the Videograph process, it can also operate as a facsimile system for high-speed scanning and direct reproduction or transmission of graphic material such as microfilm, documents —even mail. When used for facsimile, the unit includes a sending unit approximately 4 ft high, 4½ ft long and 2 ft wide. Receiver or printer is slightly larger. Both sending and printing units have paper transport mechanisms to accommodate sheets ranging from postcard to legal size. They are also adaptable to roll-feed mechanisms such as those usually required in address-label printing.

Important to the system is an electronic character generator which translates the pulse language into television-like signals representing alphanumerical symbols. These are fed into the electrostatic printing tube or an ordinary television receiver at a rate of 10,000 lines per min. The receiver converts the video signals into a printing record, or a visual display.

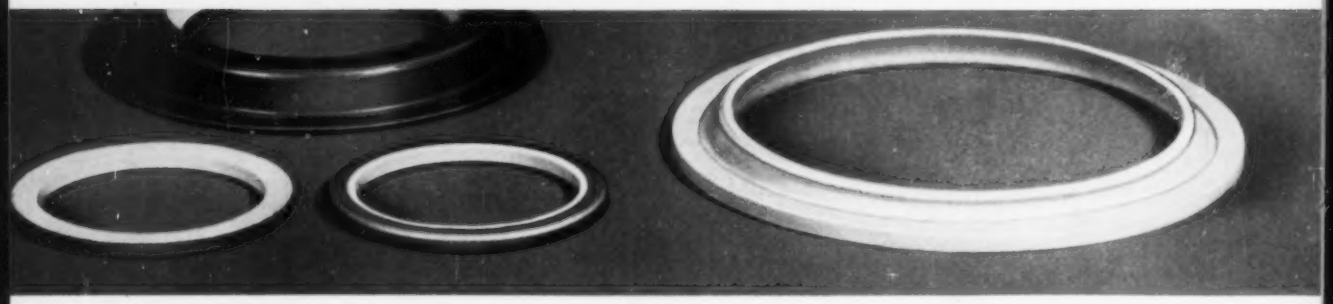
The electrostatic printing tube has a pattern of short straight lengths of wire embedded in, and perpendicular to, the tube face (approximately 250 to the inch). When the electron beam hits the end of the wire on the inside of the tube a tiny corona is discharged from the outer end of the wire onto the paper touching the outer face of the tube. In this way a tiny spot of electrostatic charge is placed on the paper. Next, positively charged thermoplastic powder is sifted over the paper and clings to the charged spots. The paper then passes a heating stage to bond the plastic permanently to the paper.

PRESENT USE

As built for a leading publisher to process its weekly subscription operations, the Videograph equipment will received coded information from computer tapes and edit this data for the purpose of rejecting unwanted information such as expired subscriptions. Properly edited signals will then be sent to the Videograph printer which will prepare rolls of magazine address

(CONTINUED ON PAGE 23)

WHAT TYPE "RUBBER" MAKES THE BEST PARTS?



If there was one answer to the question above,

Garlock's job of compounding, molding, and extruding rubber to your specifications would be extremely simplified. But, as you know, each type of rubber has its strong points:

For example, Natural Rubber

is resilient, has high tensile strength . . . perfect for air springs, tubing, electrical insulation. *Styrene butadiene* has excellent resistance to aging, costs less . . . applied widely as weather stripping, bushings and grommets, gaskets. Other popular types—nitrile, neoprene, butyl, silicone, new Viton*—will each perform better under one set of conditions than another.

Molded and Extruded Rubber

parts are more of the Garlock 2,000 . . . two thousand different styles of packings, gaskets, and seals for every need. Call your local Garlock representative, or write for Catalog AD-167.

Make the right choice.

Discuss your designs with Garlock; find out what rubbers will do the best job for you. Learn, too, about Garlock's complete processing facilities . . . about the thorough quality-control and testing programs. You will find Garlock an ideal source for all your molded, extruded, and die-cut rubber parts.

*DuPont Trademark

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GARLOCK

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Canadian Division: The Garlock Packing Co. of Canada Ltd. • Plastics Division: United States Gasket Company

labels at the rate of 36 labels per second. Machine is equipped with automatic paper-slicing and roll-changing mechanisms to permit uninterrupted operation. As a result, two Videograph printers will prepare over 10 million address labels per week on a one-shift basis; the same work load is now being done by 18 machines working two shifts.

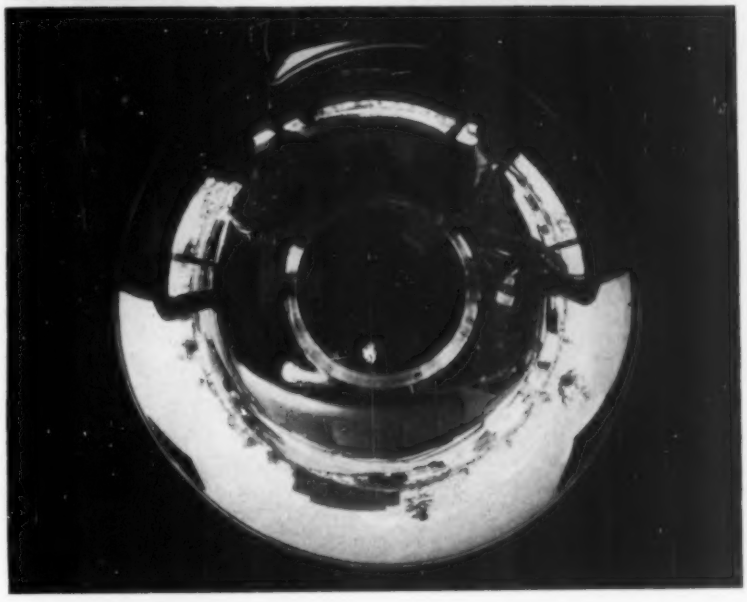
A B Dick also announced that its process will be used by the Denver & Rio Grande Western Railroad for high-speed facsimile transmission of waybills and other documents over a microwave communications system connecting the seven main freight terminals of the railroad.

FUTURE USES

The company foresees a wide range of applications for the new system. Included among many considered are: reproduction of accounting, statistical, scientific records from systems employing digital computers, producing instantaneous visual records of moving objects such as railroad trains, traffic patterns, etc; displaying stock-market quotations on conventional receivers and inventory conditions in response to keyboard inquiry. Military applications include the above as well as: recording of telemetered data in the form of analog functions covering readings such as temperatures, altitudes or voltages; and decoding and producing records of facsimile information transmitted by radio. Applications in government include: remote transmission of "mug" shots, fingerprints and other identification data in law enforcement operations; and reproduction of data stored in libraries (library of Congress), US Patent Office, etc, where high-speed data retrieval systems are concerned. ■

Sealed Cooling System for Cars Sought

DETROIT—Chevrolet's D H McPherson, at the Society of Automotive Engineers' recent Atlantic City meeting, called attention to a major car industry trend to a sealed cooling system. But first, a stable synthetic coolant with a specific heat of 1 or greater must be developed. Such a system would, of course, soon decimate sales of antifreeze, inhibitors and cooling system maintenance. ■



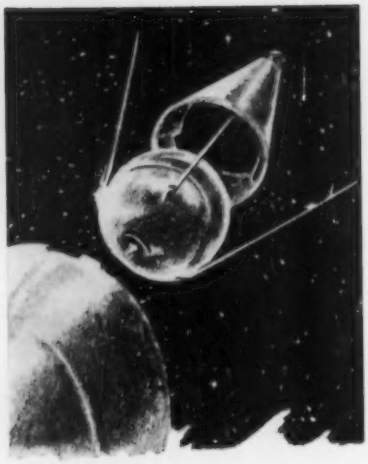
All-around pictures . . .
are taken by 16mm camera alongside driver and show what's really happening as he drives through traffic. Tape recorder gives driver's story of what he thinks is happening. The two versions are then compared by Ford Motor Co traffic-safety researchers.

Camera, Tape Recorder Show Driver Errors

DEARBORN, MICH—An auto safety research technique in which a 360° camera along with a tape recorder make it possible to establish causes of driver accidents is being tested by Ford Motor Co. Developed by Bell Aircraft and modified by Cornell Aeronautical Laboratory, the technique calls for placing a standard 16mm camera upside down on a tray that extends from beneath the dashboard alongside the driver (see above). Camera is aimed at a mirror which relays a 360° view from a convex reflector. The tape recorder microphone

(Continued on page 24)

←CIRCLE NO. 22 READER SERVICE CARD



Chances are it will be equipped with—SOSS INVISIBLE HINGES

"The Hinge That Hides Itself"

Soss Invisible Hinges enable you to do a better job whether you're designing a rocket to the moon or a new typewriter.

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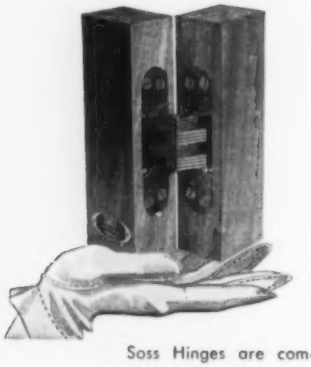

Soss Hinges are completely hidden from view when doors or lids are closed. They are the only hinge that creates the flush, smooth streamlined surfaces so necessary for modern design. Unique Soss Hinges are available in a wide size range to meet every requirement.

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Harper Station, Detroit 13, Michigan

is located in front of the mirror, and is operated off the car battery by means of a converter.

Ford officials say the tape recordings of driver observations of the traffic scene can be related to and compared with the filmed record of vehicle speed, distance, time, change of speed and direction. Empirical formulas and mathematical equations are applied to this research data which are then recorded on punched cards so that statistical techniques and evaluations can be made.

Ford Motor Co officials say the success of such efforts depends on future cooperation of engineer, stylist and safety educator. ■

Parametric Amplifiers May Boost Radar's Range by 100%

A solid-state, diode-type parametric amplifier (lower left hand corner), measuring 8 x 6 x 1 in., which has no hot cathode or noisy electron stream and which gives an improvement in noise figure by 3 to 8 db over the best superheterodyne receivers, has been developed by Hughes Aircraft Co. The device is said to improve radar range by as much as 100% and may solve major problems of jet air-traffic control.

"Paramp" also gives improved overload characteristics, amplifying smaller signals but withstanding higher incident power levels without burnout or degradation of performance. Equipped with a specially developed diode which has low equivalent series resistance at microwave frequencies, it has no external auxiliary equipment such as field magnets and focusing coils as required by ferrite amplifiers, electron-beam amplifiers and masers. The new amplifier is also being studied as a pump source, with development of a compact, lightweight, all-solid-state pump as prime objective.

Family ot parametric amplifiers viewed here include: (1) L-band, (2) C-band, (3) another L-band of different configuration; (4) S-band, (the one developed for radar system application) (5) another C-band, (6) X-band with circulator attached, (7) another C-band, and (8) L-band designed also for UHF. All but the S-band are still being developed.

CAMPCO PROGRESS

latest developments in plastic sheet film fabrication

New Thermoplastic resists heat, chemicals, electricity

Campco Polypropylene

A new wide area of product fabrication from thermoplastics is now possible with recently introduced Campco Polypropylene sheet. Because of an unusual combination of dielectric, chemical and heat resistant properties . . . the material is especially useful for electric appliance parts, chemical vats, ducts and fittings, and items requiring sterilization.

Compounded by stereospecific polymerization of low cost propylene gas, the new plastic is highly impervious to stress cracking and can withstand temperatures to 240° F. under average load service conditions. This makes it ideal for food service and hospital items that must be boiled or autoclaved.

The plating tank illustrated below takes advantage of these same properties and also the material's fine behavior under chemical attack. It can be custom fabricated to size with a fuel hood and connection for exhausting vent heat.

Campco Polypropylene has good rigidity and strength in thin sections . . . and has the lowest specific gravity of any plastic material (0.91). Thus, more products can be produced per unit weight of Polypropylene than from any other formable sheet material. In gauges .010" to .025", widths to 40", wide range of colors.

Deep draw, multi-curved dish cover and tote box of Polypropylene.

Plating tank of Polypropylene by American Agile Corp., Bedford, Ohio.

Puts "Boys" On Wheels

Campco Tripolymer Styrene Sheet

. . . for toy automobiles and the real thing, Campco Tripolymer Styrene Sheet has become a logical choice of leading manufacturers. Its high impact strength at extremely low temperatures and high rigidity make it a *natural* for many automotive applications. For the toy car it serves as a durable "boy-resistant" body that lasts longer than metal. And for Dad's car has many uses as headliners, scuff boards, center post covers, interior door panels and seat backs.

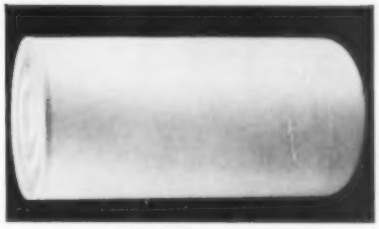
Campcolite has excellent chemical resistance, low moisture absorption, exceptional dimensional stability. Of special note is its high tensile and flexural strength. It machines readily too, and can be rapidly die-cut to accurate size and shape. Sheets can be bonded together by using commercially available cements, or welded with heat and pressure.

These properties and a relatively low cost, together with a full range of colors and the fact it lends itself to all conventional forming techniques . . . recommend Campcolite for many jobs now using more costly materials.

Available in smooth or Haircell grain embossed finish. Special effects can be had by incorporating grain in forming dies. Gauges .020" to .125".

New Linear Polyethylene Tank of Campco Sheet

This all-plastic tank is a product of Premier Plastics Co., Milwaukee, and is one of the many commercial products now being formed from Campco Linear Polyethylene. The material's unusual combination of rigidity, heat and chemical resistance make possible many distinctive applications. It withstands a variety of chemicals including even some acids which attack glass . . . is exceptionally rigid and tough with good dielectric properties. Easily forms, machines. Recommended for both industrial and consumer products—housewares, containers, electrical products, toys. Gauges .020" to .125", custom sheet and rolls.



One Reliable Source

Now you can fill all your requirements for thermoplastic sheet and film from one reliable source. Campco now offers Butyrate, Acetate, Styrenes, Polypropylene, Nylon—in sheets or rolls depending on gauge . . . cut to size if desired . . . clear or colored transparent . . . translucent or opaque.

Received Your Campco Personal File? This data-packed reference file on thermo-plastic sheet and film is yours on request—just send name and address on Company letterhead to Campco, 2710 Normandy Avenue, Chicago 35, Illinois.

CAMPCO Sheet and Film, **a Division of Chicago Molded Products Corp.**

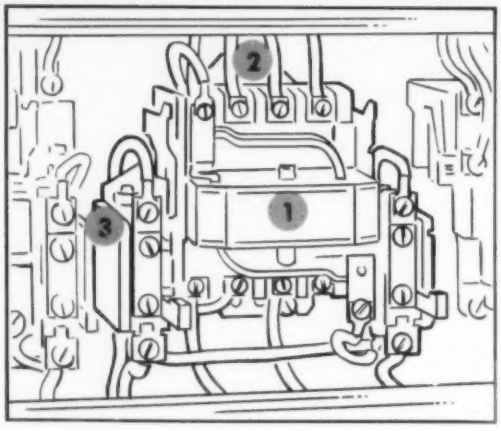
25

CIRCLE NO. 25 READER SERVICE CARD

CIRCLE NO. 26 READER SERVICE CARD →

NEW SIZE 2 MAGNETIC STARTER

Now available in G-E 100 Line design



1. **42% SMALLER SIZE.** The new 100-Line General Electric magnetic starters (Size 0 and 1) are only as high as G-E 4- and 6-pole relays. You no longer waste space on your panels.

2. **STRAIGHT-THROUGH WIRING.** All you do is insert your leads into the pressure-type terminals and tighten. They are on the front of the new G-E magnetic starter — easy to reach.

3. **ADJUSTABLE OVERLOADS.** A new finger-tip adjustment of the overload relay trip setting allows easy adjustment between plus or minus 15% of the nominal heater rating.

NEW G-E SIZE 0 AND 1 MAGNETIC STARTERS

Cut cost by reducing panel space and assembly time

BECAUSE THEY'RE 42% SMALLER — FEATURE STRAIGHT-THROUGH WIRING, FRONT CONNECTIONS

These new, radically different 100-Line General Electric magnetic starters have been designed to help you save panel space and assembly time.

SAVE PANEL SPACE. The new starter is 42% smaller — now approximately the same height as G-E 4- and 6-pole relays. When starters and relays are mounted side by side, you no longer waste space below the relays. G.E.'s straight-through wiring and cooler operation mean you need only ½ inch on each side of the new starter. The coil inrush current has been reduced so you can use a 40 volt-amp control transformer. You also have your choice of vertical or horizontal mechanical interlocking on reversing starters. The savings in panel space also help meet the new JIC specifications.

SAVE ASSEMBLY TIME. The new, 50% lighter weight G-E magnetic starter is fast and simple to install and connect. Straight-through wiring means you attach leads to the terminals at the top and bottom of the starter — no more run-a-round wiring to take extra time and space. You mount the starter by simply sliding its key holes over three mounting screws on the panel. This new General Electric magnetic starter will easily cut your assembly time.

Your customers will enjoy extremely quiet, dependable operation — and appreciate the fast inspection and the 20-second disassembly, made possible by "snap-slide" construction. They'll also like the space savings your smaller, more compact panels provide.

Like more information? Contact your nearby General Electric Apparatus Sales Office, or write to Section 731-15, General Electric Co., Schenectady, N. Y., and ask for bulletin GEA-6611.

General-Purpose Control Dept., Bloomington, Ill.

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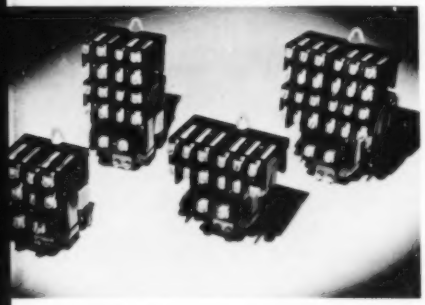
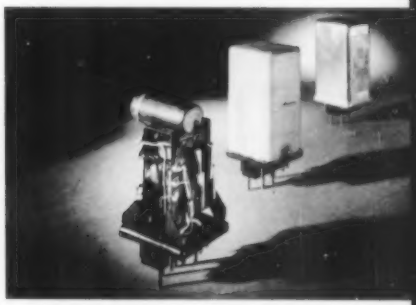


MACHINE TOOL RELAYS have front connected terminals, are easy-to-wire from four directions, and are also available in latched-in forms.

OIL-TIGHT PUSH BUTTON UNITS. The new push to test unit checks for burned out bulbs — the new illuminated unit reduces panel space 50%.



STATIC CONTROL components, in easy-to-use plug-in form, provide reliability for critical jobs. Photo shows three steps of encapsulation.

the LEAD *newsletter*

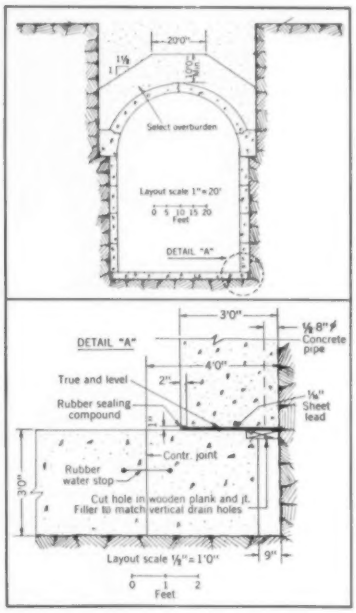
Lead is a remarkably versatile material. It is found in hundreds of familiar uses and in a wide range of entirely new applications. Here are a few of the unique properties that caused lead to be selected for use in some unusual and interesting new applications.

Practically Indestructible Electrochemically

A "lead dry cell" battery having a completely reversible electrochemical system which does not gas on charging and is therefore practically indestructible has been developed to power transistor circuits. Even after years of use its capacity, 9/10 of a volt at 1½ amperes, is not greatly affected by repeated recharging. It has high shock and vibration resistance, particularly in the temperature range of −65 to plus 165 deg. F. When mass produced, it is believed that costs would be about 50 per cent higher than a Mercury battery which does not equal its amperage-voltage-temperature advantages. The battery anode of the lead dry cell "mighty midget" battery is made of consolidated Grenox or lead-lead oxide. It weighs only 40 grams as compared with 95 grams for the conventional flashlight battery. Gram for gram, both are equal in capacity. In the uncharged state, it has a virtually indefinite shelf life.

Sound Attenuation

Materials impregnated with lead powder have proved most effective in reducing aircraft noise. The sound deadening material is a plastic such as vinyl, heavily impregnated with lead powder, and backed with glass fibre or cotton duck. Although the fabric is relatively thin, the lead mass is very effective in deadening sound. Lead in other shapes, such as sheet or foil will also act as an excellent sound isolator. As pointed out in the article "Acoustics for Modern Interiors," ARCHITECTURAL FORUM, April, 1959, "... if the wall is heavy and limp, like a soft lead sheet, it is less capable of moving with the sound waves, and sound is less likely to go through it."



Lubricity

The new Niagara Power Project will require approximately one million pounds of 1/16 inch thick sheet lead. Here lead is used as a lubricating base and seal beneath the concrete walls of 4½ miles of water-conveying conduits that pass through limestone cuts. Lead was specified because, under the influence of rock squeeze, lead's lubricity permits lateral movement of conduit walls. This maintains the conduits structurally, and lead's high sealing quality will keep water leakage at a minimum.

Optical Reflectivity

Compounds of basic lead carbonate and lead monohydrogen phosphate – through an optical effect dependent upon multiple reflectivity – are now providing a new way to duplicate the appearance of pearls or mother-of-pearl. Synthetic "pearly" pigments are being widely used in costume jewelry ... motion picture screens ... synthetic leather ... molded plastics ... and are giving a pearlized look to paint jobs on certain custom-model automobiles.

Improved Strength & Rigidity

Hard lead – an alloy containing from 6 to 7½% antimony – preserves all the desirable easy-to-work properties of soft lead, yet improves strength, rigidity and hardness. Over 8,000 lbs. of hard lead sheet line the gutters of the new dormitory building at Duke University, Durham, N. C. Hard lead was selected for this job because it resists corrosion ... will not stain the adjacent limestone ... and assures a watertight drainage system that can be counted on to last the life of the building itself.

The broad range of lead's potential uses is taking researchers into an astonishing number of widely different fields. Its unique properties continue to increase lead's value to modern technology.

Research is currently being conducted in the following important areas: low melting frits for porcelain enameling of aluminum and steel; lead ferro-electric materials; lead glazes for structural clay products; wrought lead products by powder metallurgy and many others.

If you are faced with a product development problem, lead may prove to be the ideal solution. Don't hesitate to ask for information and technical assistance. Write: Office of Technical Information, Lead Industries Association, 60 East 42nd Street, New York 17, N.Y.

1970

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Lead Industries Association

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Confusion Mounts After Court Kills US Security Program

WASHINGTON—Complications and difficulties are foreseen for defense plants following the Supreme Court's decision that null and voids the present security program. According to the Court, Pres Eisenhower or the Congress must specifically authorize such a program. Sen Thomas C Henning, Jr, chairman of the Judiciary Subcommittee has already opened hearings on the subject, and indications are that the Administration will push for quick action to restore some kind of an industrial-security program. The longer the delay, the more confusion.

The Court refused to sanction security procedures adopted by Defense Dept officials by which civilian workers are denied access to confidential information, and cannot confront and cross-examine people who challenge their loyalty. The Court did not attack the constitutionality of such procedures but, instead, based its decision on the fact that the Defense Dept's ruling lacked clear-cut authority from either the President or Congress.

The case decided by the Court involved aeronautical engineer William L Greene, former vice-president of a Maryland electronics firm. Greene lost his job when the Navy Dept and the Industrial Personnel Security Review Board revoked his security clearance. Because almost all the firm's work was on classified contracts–primarily on a Navy aircraft flight simulator designed by Greene–the firm had to dismiss Greene. He has since been unable to find employment as an aeronautical engineer, is presently working as a draftsman.

Greene, under procedures used in some 1000 cases revoking or denying clearances during the past five years, was denied the right to confront witnesses who had submitted evidence used against him in the security hearings.

Administration legislative proposals might concede the right to confront some witnesses in security hearings, such as friends or acquaintances. But it is doubtful that FBI or confidential agents would be made available.

The question in the meantime for defense contractors is, "What happens tomorrow or the next day?" In his version of the decision Chief Justice Earl Warren made it plain that where confrontation of witnesses by the accused is denied, any hasty reenactment of present procedures will run into serious difficulties with the Court –although this was not explicitly stated.

For the present, classified defense work will be open only to those who already have security clearance. But confusion is likely to arise where new employees fail to pass security tests, or where an employee's existing clearance is currently under review. ■

Government Pushes Water Conversion

WASHINGTON—The third plant in the government's $10-million program to develop economical plants for producing fresh water from saline and brackish water will use an electrodialysis process (*PE, June 29, p 11*).

The 250,000-gal per day plant to convert brackish water will be located in the northern area plains (the Dakotas, probably) or the arid areas of the southwest. Two processes for sea water conversion have already been selected.

The Interior Dept's office of Saline Water has not yet estimated the cost of the plant which will use an electric current to sift out the salt ions. Research on the membranes has been done mostly at the Denver labs of Interior's Bureau of Reclamation.

Several electrodialysis plants are already in commercial operation with capacities up to 84,000 gal per day, and a 3-million-gal per day plant is under construction in South Africa. ■

Starting Salaries Up for Case Institute Grads

CLEVELAND—Average starting salary for Case Institute of Technology June graduates is $501 a month, Dale E Barbee, director of Student Aid and Placement announced today. Last year's graduates started at an average salary of $484. This year only two graduates accepted jobs at less than $450 a month. Six accepted jobs at over $585 a month. Highest paying

(*Continued on page 30*)

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SERIES W

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to 25 A. resistive at 115-230 V., A. C.; 1 h.p., 125 V., 2 h.p., 250 V., A.C.; D. C. and other higher ratings on request.

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jobs went to mechanical engineers, electrical engineers, and chemical engineers.

"The mounting curve of salaries offered engineering graduates at Case and other colleges arises from both the need of the nation for engineers and the fact that in most engineering schools, enrollments have been dropping for the past two years. Certainly we foresee no slackening in the demand," Barbee said.

Of 284 graduates the largest number, 189, are going into business and industry. Some 56 are going on for full-time graduate study, the largest number in recent years and an indication of the growing importance of graduate education in engineering and science. Seventeen have still not decided on their careers; 14 are committed to city, state, or federal government jobs. ■

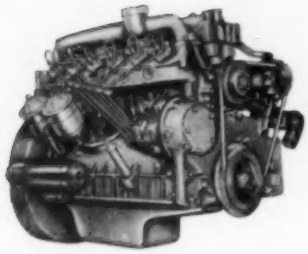
'Atlas Has No Design Problems'—Pentagon

WASHINGTON—Faulty design was not responsible for the halt in flight testing of the Atlas ICBM following five consecutive launching failures with the "D" series of the missile. This is the last job lot of test missiles—the final engineered design—built just before output of operational models begins. The stop-order will delay by at least two months installation of the first operational missiles at Vandenberg AFB, Calif, originally scheduled for July 1.

Pentagon officials say the latest test fizzles do not result from any "fundamental design problems" in Atlas. The failures are typical of the sort of thing, they say, the military has encountered in final test models of many missiles where new requirements for serviceability are designed into the vehicle.

The stress on serviceability has introduced a "new set of reliability variables." These are reflected in the telemetry readings of the last Atlas tests. Officials say the readings show a "series of tough little breaks"—a defective valve, pressure losses, transient signals in the guidance, minor structural problems, and other minor mechanical failures.

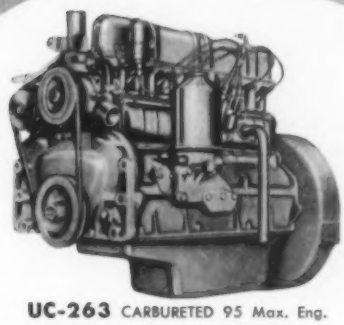
All Atlas vehicles now at the flight test stage are undergoing necessary changes. Test launchings are expected to be resumed within a month. ■



UD-236 DIESEL 75 Int. Eng. hp. Interchangeable with UC-221.

UD-282 DIESEL 95 Int. Eng. hp. Interchangeable with UC-263.

UC-221 CARBURETED 75 Max. Eng. hp. Interchangeable with UD-236.



UC-263 CARBURETED 95 Max. Eng. hp. Interchangeable with UC-282.

Diesel price barrier broken by IH 6-cyl. interchangeable engines

By making these new interchangeable 95 and 75 hp. International engines available in your products, you can switch from carbureted to lowest cost diesel power without further engineering expense, materials cost and layout and shop time. In addition, these compact 6-cylinder diesel engines offer the effective staying power found only in 4-cycle design.

Five features make these diesels standouts: 1) direct starting; 2) time-proven International pre-cup injector with single orifice nozzle for most complete combustion; 3) a glow plug in each pre-cup speeds starting by heating entire fuel-air mixture; 4) diesel injection pump is simple and dependable; and 5) an oil temperature stabilizer that increases engine efficiency.

Both the UC-263 and UC-221 carbureted engines have inherent diesel ruggedness in that each differs mainly from its interchangeable diesel counterpart in cylinder heads and pistons.

Features that contribute to smooth, efficient, economical power on gasoline, natural gas and LP Gas include: valve-in-head design; best compression ratio for each fuel; 18 mm. spark plugs; updraft carburetor and top outlet exhaust; low-friction stepped-dome pistons; and fully machined combustion chambers for uniform power from each cylinder.

Get complete details on any of these engines by writing or calling International Harvester Co., Engine Sales Department, Construction Equipment Division, Melrose Park, Illinois.

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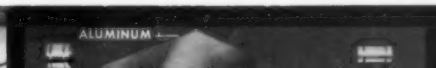
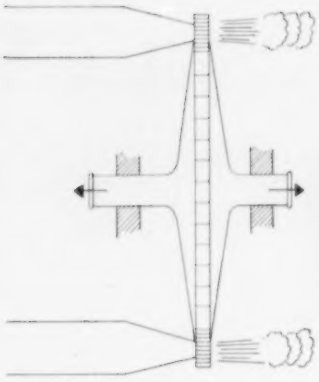
CIRCLE NO. 31 READER SERVICE CARD





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CUSTOM FLOW DIVIDER SOLVES FUEL METERING PROBLEM FOR TURBINE BUILDER

This multiple unit is a series of custom Roper pumping elements driven in tandem by a hydraulic motor. It accurately meters distillate or residual fuel oils to the combustion chambers in a large gas turbine. These rugged units, used on both mobile and stationary turbines, withstand extreme temperature changes during operation. This unusual application is another example of Roper's ability to tackle — and solve — difficult pumping problems.

If you have an application where a standard pump does not fit your needs, Roper can custom-design and build pumps that meet your requirements. For further information, call the factory or the Roper representative in your area.

ROPER PRINCIPLE OF ONLY TWO MOVING PARTS ASSURES EFFICIENCY . . . DEPENDABILITY

Roper Pumps are the rotary gear type — two equal size pumping gears operating in a case with proper clearance. This factor promotes long service life and optimum performance on all applications.

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ROTARY PUMPS

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397 Blackhawk Park Avenue
Rockford, Illinois

GE Tops US Listing of R&D Contracts

WASHINGTON—Among 500 companies awarded prime military contracts for experimental, developmental and research work, General Electric, North American Aviation, General Dynamics, Boeing and Lockheed Aircraft head the list in dollar value. Of 94 government agencies and non-profit institutions, Massachusetts Institute of Technology, California Institute of Technology, Johns Hopkins Univ, Univ of Michigan and Cornell Aeronautical Laboratory rank in that order. List was compiled and released by Defense Dept and covered small as well as large organizations with contracts valued at $10,000 or more.

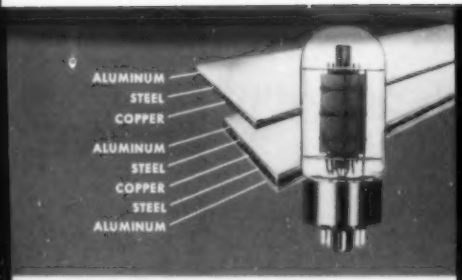
GE's R & D contracts are valued at $302,045,000, NAA's at $288,302,000, General Dynamic's at $256,093,000, Boeing's at $245,323,000, Lockheed's at $181,145,000. Of the non-profit organizations, MIT's contracts were valued at $55,595,000, CIT's at $45,333,000, Johns Hopkins at $23,160,000, Univ of Michigan at $15,816,000 and Cornell Aeronautical at $12,958,000. ■

US Seeks More Funds for Air Pollution R&D

WASHINGTON—Congress is intent on voting more funds for development of air pollution control. The Senate has approved a measure to extend the Federal Air Pollution Control program for another four years and boost the annual expenditures from the present $5-million a year to $7½-million a year.

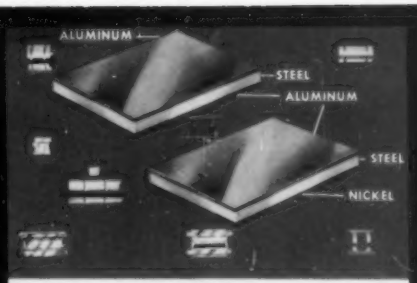
The idea is to spend most of the 50% increase for more research on devices to cope with automobile exhausts (*PE, July 6, p 37*). Increased funds would also go for university training of technical experts and basic research in control methods and cheaper instruments to measure air pollution. The increases were sought with the backing of last fall's National Conference on Air Pollution.

Opposition has hit the request of the Dept. of Health, Education and Welfare for authority to hold local hearings and make recommendations for federal legislation. Opponents say air pollution problems are local, not national, and that federal authority should not be extended to the local and state problem. ■



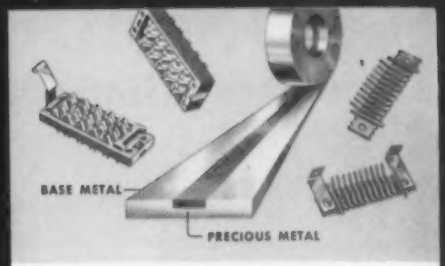
ALIRON® Copper-Base and Copper-Cored

Three-layer and five-layer materials used for anodes in rectifier and amplifier tubes. Provide longer power output life . . . uniform heat dissipation . . . high electrical conductivity . . . improved anode reradiation . . . and reduce costs.



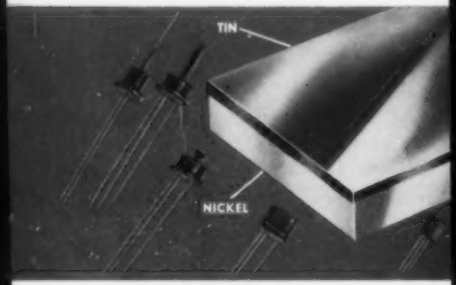
ALNIFER®, NIFER®

These clad metals are used as alternate materials for solid pure nickel in electron tubes. They conserve critical material . . . reduce costs substantially. Supplied in annealed coils ready for your production.



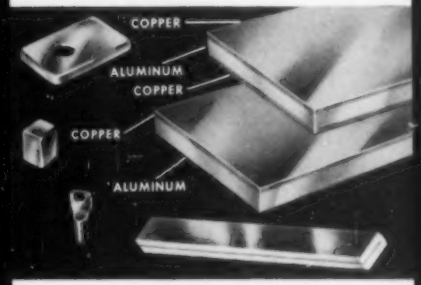
CLAD PRECIOUS METAL CONNECTOR MATERIALS

High reliability of connectors, clips, terminals obtained by using gold and other precious metal alloy stripe materials . . . place high performance materials in the contact areas . . . cost-savings and improved performance over gold electroplated parts.



TIN CLAD METAL STRIP and other Semiconductor Clad Metals

A number of combinations of clad metals are available for use on base tabs, lead wires, whisker wires, base materials and enclosures in silicon and germanium diodes, transistors and germanium power transistors.

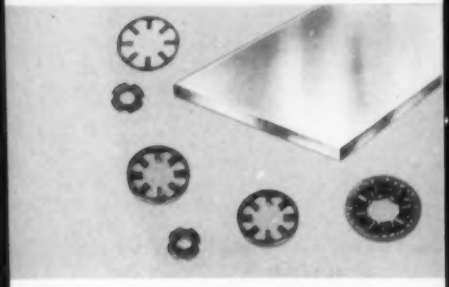


ALCUPLATE®

Easily formed, deep drawn or spun. Used for waveguides, component cases, variable condenser blades, chassis and electrical or thermal conductive parts. Light in weight, saves up to 30% over the cost of solid copper.

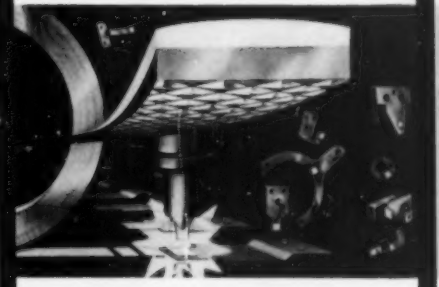
COPPER-CORED GLASS SEALING WIRES

Featuring a sound metallurgical bond, these wires give three times greater conductivity than solid 52 alloy wire of equal diameter . . . they facilitate miniaturization. Features include: leakproof seal between alloy and core, high electrical and thermal conductivity, lower costs.



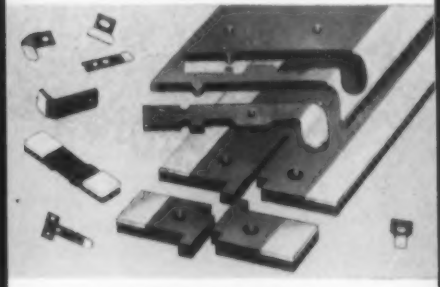
ALUMINUM-IRON ALLOYS

For magnetic applications requiring low core losses and high permeability at low flux densities in current and pulse transformers, relays, gyro mechanisms, servo mechanisms, missile guidance systems, etc.



CLAD ELECTRICAL CONTACT TAPES

For products you want to automate, this modern contact form permits greater latitude in contact assembly design . . . automatic assembly of two or more parts in a single operation. Tape contacts are easily attached by spot welding . . . are self-aligning . . . and allow broader assembly tolerances. Save up to 40% in contact costs.



CLAD CONTACT MATERIALS

Single and double inlay, overlay and toplay provide better electrical performance, longer operating life and lower fabrication costs. Complete assemblies can be made to close tolerances by single blanking and forming operations.

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Electrical Contact Materials

Solve Design Problems...

Provide High

Performance Reliability

General Plate clad precious-to-base or base-to-base metals are inseparably bonded by a patented solid-phase bonding process without the use of brazing alloys or other intermediate material.

If you are seeking metals with useful characteristics that can't be found in a single metal or alloy, investigate clad metals. If you want stronger or lighter components — or better electrical and mechanical properties — or fewer corrosion problems — or if you are interested in conserving critical metals or reducing parts costs, you can profit by using General Plate Clad Metals.

Write for a General Plate Clad Base Metals catalog today. Or better yet, why not talk over your requirements with a competent field engineer? His knowledge of the applications of clad metals is yours for the asking. No obligation, of course.

METALS & CONTROLS

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A DIVISION OF TEXAS INSTRUMENTS INCORPORATED

GENERAL PLATE PRODUCTS: Clad Metals • Electrical Contacts • Truflex® Thermostat Metal
Platinum Metals • Reactor Metals • Radio Tube & Transistor Metals

TRENDS in appearance design . . .

Soviet Industrial Design

SAMUEL SCHERR

Front end of the new "Chaika".

Newest Soviet family-type car, the "Moskvich".

■ Recollections of my trip across the Soviet Union earlier this year, plus what I have heard and read about that nation, all emphasize how rapidly it's changing—and the resulting sharp contrasts. But nowhere is this more evident than in the USSR Exhibition at New York's Coliseum, which I toured for PRODUCT ENGINEERING. For example, I saw many new—and even still-to-be-announced—products when I visited the tiny USSR nucleus of industrial designers. Yet here on exhibit are still-newer models of radio and television sets. Some represent new trends in the USSR.

True, one group of TV sets uses plywood for wrap-around cabinets of broad radius, not unlike US radio design of 25 years ago. But there are several apparently later designs (with screens as large as any sold here) that have plainer, squarer housings of considerable attractiveness. In some, metal and formed plastics have been used effectively. One TV chassis folds away into a chess table—as some sewing machines do. A tiny all-transistor FM radio also seemed quite original.

Consoles, and stereo, too

However, these models show the only new thinking and tasteful design in Soviet radio and television equipment. There are a variety of radio-television-record playing (tape, too) consoles, as big and expensive-looking as any I have seen, and a number of multiple-unit stereophonic systems. Workmanship is excellent, but with lack of coordination and judgment in use of materials—and all models are overdecorated. Prevalent is the same Cadillac "V" that appears on many US products.

There is also a hand-held industrial TV camera of excellent workmanship—but a purely decorative fin runs its entire length!

Similarities between technologies do exist, and amusingly. The same performance requirements have bred in the USSR exactly the same electronic "black box"—identical U-shape handles, wrap-around sheetmetal housings and black crinkle finish. Incidentally, I noticed on this and electronic and communications equipment that key-type controls in USSR products all have exactly the same component—a squarish, soft-cornered, ivory-colored shape, probably plastic. (The reason: designers must utilize available standard parts—Ed).

Differences? It seems to me that using too many materials in the styling of the same product and, particularly, using some of the costliest kinds of wood and plastic construction, indicate a basic difference between economies. Such design could not long survive America's price-competitive distribution system. On the other hand, it can be pleasantly surprising to see how little emphasis goes into product and corporate identity.

Competition might help

Still, I believe the right kinds of competition between design and engineering staffs might do Soviet products some good.

One thing the USSR Exhibition left me curious about: I saw a fairly wide selection of small and major appliances for sale in stores in various Soviet cities during my trip. Yet only a refrigerator and a new food-mixing machine (*PE*—Apr 20 '59, p 39) are in this New York show.

In the machine-tool section, I found a most interesting example of design evolution. Standing side-by-side were tape-controlled profile and vertical milling machines. While many of the individual castings, housings, and motor enclosures in the older vertical machine were clean-lined enough, over-all integration was lacking. As a result, operation, operator safety and ease of cleaning and maintenance would be difficult—some wiring was exposed. The only decoration was raised or louvered straight lines—not unlike the detailing we used to call "steam lining".

The newer profile shows considerably more integration; contro's are more carefully placed and grouped, the main panel is slanted for greater operator visibility. There is only limited use of color coding, however. Unfortunately, on both milling machines I noticed levers at knee-height the operator could easily bang himself or even accidentally actuate the equipment. Indications are that this minimal styling is carried out by the Soviet engineering staffs, without training in styling.

This probably applies also to the farm tractors shown. The basic housing indicates a desire to emphasize the functional rugged look. There is also an attempt to capture a feeling of movement and speed. These tractors are on a par appearance-wise with many American designs.

Perhaps the most honest and effective use of materials is in an attractive tower crane for building construction. It is tubular, and the base is a fine example of the use of steel disciplined by function. The operator's cab seems, though utterly functional, very pleasing to the eye.

The originality and imagination displayed in engineering this crane is entirely lacking in the passenger cars, which includes five of the newest. Only the worst mistakes of American and European design have been borrowed, and most of them have been made worse. This is true of both interior and exterior styling.

The front of the Chaika, newest of the big cars, is a mass of encrusted chrome and gilt, surmounted by an ugly version of the Cadillac "V" in white-painted sheet metal. Rear quarter panels and taillights are from the '57 Buick. The Zil, biggest Soviet car made, has an inflated version of the Packard's taillights of a few years ago—plus even more chrome. The Moskvich station wagon has a poorly executed two-tone color scheme, is over-decorated.

Cars coming fast

Only the Volga shows promise. This new family-size sedan has a clean profile. There are some signs of reserve in decoration, and the front end shows that its designers are starting to be original.

This thinking seems to be the result of an increasing consciousness of the need for good product design, and has a good base on which to create, too. The displays of Soviet folk crafts, painting and sculpture all give convincing evidence of a native understand and ability to achieve good forms, color and fine craftsmanship.

This will be transmitted to product design as Soviet designers and engineers become more sophisticated in product styling. Their efforts to achieve better integration and appearance in design are based on powerful motivations, primarily a determination to emulate, and if possible surpass, the best in American and European technology and culture. ■

COMING! Rozhdestvensky, who designed the USSR's exhibition, will give PE readers his evaluation of USA exhibit opening next week in Moscow.

Platinum Metals • Reactor Metals • Radio Tube & Transistor Metals

at the USSR Exhibition, New York

(of Smith, Scherr & McDermott, Akron, Ohio)

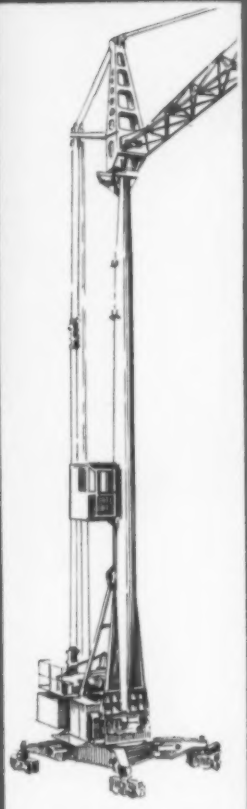
Stereophonic sound system
consists of dual speaker in separate cabinet, record player and all-band radio.

FM all-transistor radio
for use with separately installed speakers.

Finned industrial television camera

Farm tractor pulls three full-scale cutter bar units at once, abreast!

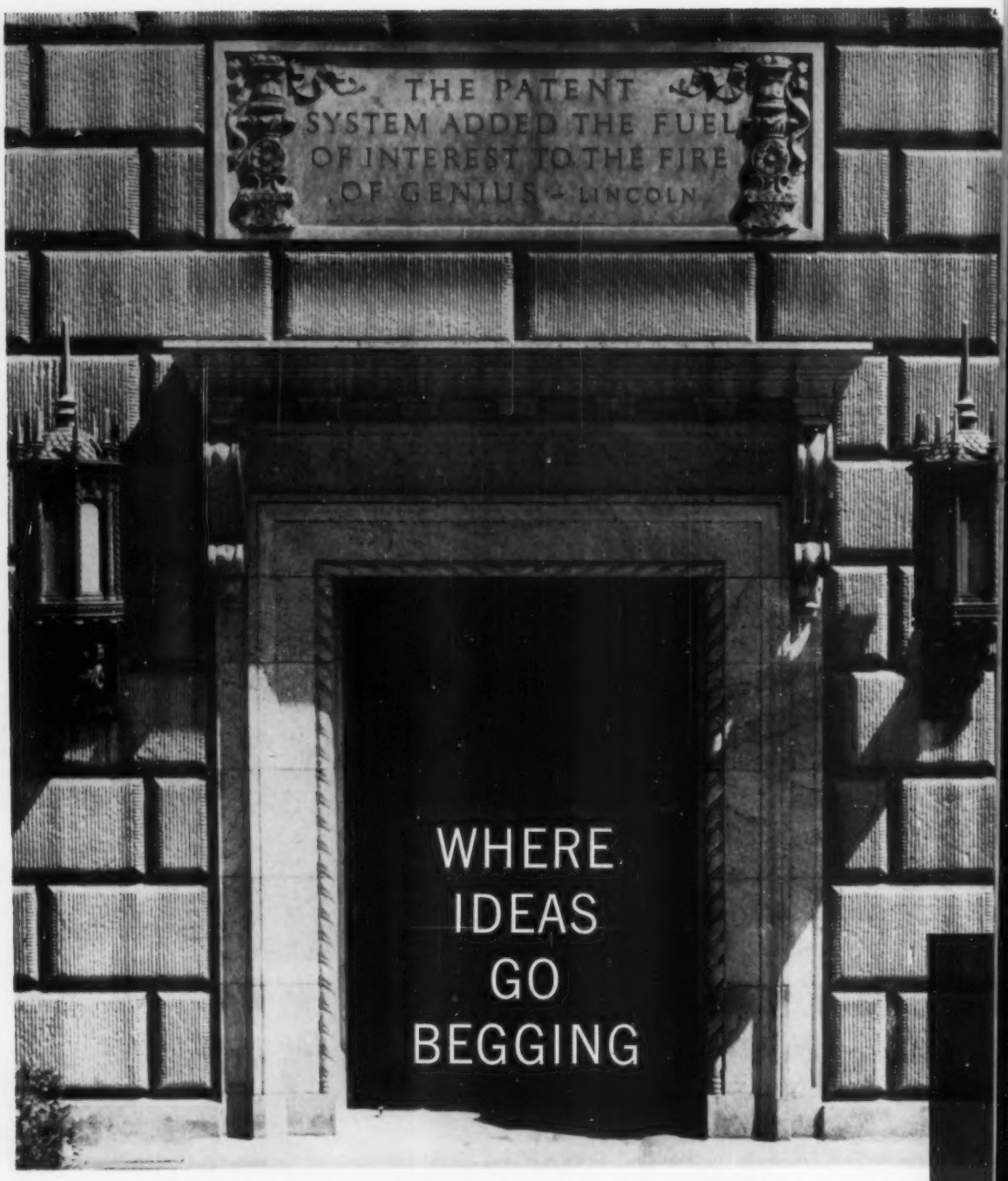
Profile milling machine
is in foreground, vertical miller in rear. Both are tape-controlled.



Tower crane used in building construction.

Television tube
disappears into top of chess table.

Controls (being adjusted by author Scherr) are located in recess beneath picture tube with speakers.



■ **A primary purpose of the patent system** is to persuade inventors to disclose their ideas to the public. The patent "monopoly" is intended as bait but it may also be something of a hindrance to more widespread application of an idea.

The words *patent pending* are used as a threatening club to warn off poachers but any product may legally be imitated right up to the date the patent issues. Every patent becomes part of the public domain at the end of 17 years.

RICHARD M KOFF *senior associate editor*

■ **77,000 per year, 300 per working day . . .** that's how many of these patent applications are received and inspected in this preliminary examination. The package may enclose one or two sheets of paper or a stack several inches thick. One application weighed in at 35 lb. Has the fee been enclosed? The Patent Office receives some $7 million in fees every year.

■ **Once accepted, a file wrapper is typed up** and two punched-paper tapes are automatically produced at the same time. The tapes will later be used in tape-controlled typewriters to produce cards used to acknowledge receipt and record progress of the application. Examination rooms are barred to the public. Each application is kept top secret in order to protect the inventor.

The US Patent Office has on file the largest store of applied technology in the world.

It's yours for the taking—many of the patents have long since expired, many others are available for purchase or licensing.

Here's how you can tap this wealth of ideas

■ **Years ago, receipt of a patent was recorded by hand** in heavy tomes. Now cards are filed in these trays that swing into position at the touch of a button. From this point until the time the patent issues, the application is in the hands of one of some 1000 examiner assistants.

■ **The Search Room contains** the biggest library of patents in the world. Here, assisted by a staff of experts, you can find any US patent by number (bound into books) or by subject (stacked in pidgeonholes). You locate the appropriate stack of patents and take them to a table in the reading room. Good lighting and a metal tray combine to make patent-flipping an easy task. This is the only place in the world where US patents are filed by subject. That is what makes Washington the mecca of patent attorneys and company representatives. The Science Library, next door to the Search Room, has five million foreign patents on file.

■ **Other Patent Office services** — include the printing and sale of issued patents. Over 100 million copies are stored on 2½ acres of shelves. A deposit account system has been set up whereby some 3000 attorneys and agents, who use Patent Office services frequently, can authorize a deduction from their accounts whenever they file an application or buy a copy of a patent. Post office-like boxes in the Patent Office may be rented and letters, notifications and copies of patents can be conveniently picked up without going through the regular mails.

You can buy a roster of attorneys and agents for one dollar from the Government Printing Office, but the Patent Office will send you a partial list of those agents in your immediate vicinity free on request. All officials in the Patent Office agree that an inventor would be well-advised to use an experienced attorney or agent. Writing claims is a specialized art—naturally each inventor wants his to be as broad as possible—and legal questions often arise in patent correspondence needing specialized advice. Only a registered attorney or agent is permitted by law to represent applicants in filing and prosecution of patent applications.

PROFIT FROM YOUR PATENT

● The battle doesn't end once you get your patent—it's only just begun. At that point you have four possible courses of action: You can arrange for manufacture of the device yourself; you can sell or license to another manufacturer; or you can wait for the world to beat a path to your door. The last will probably not be profitable—even an important invention could lie unnoticed on those shelves for the next 17 years.

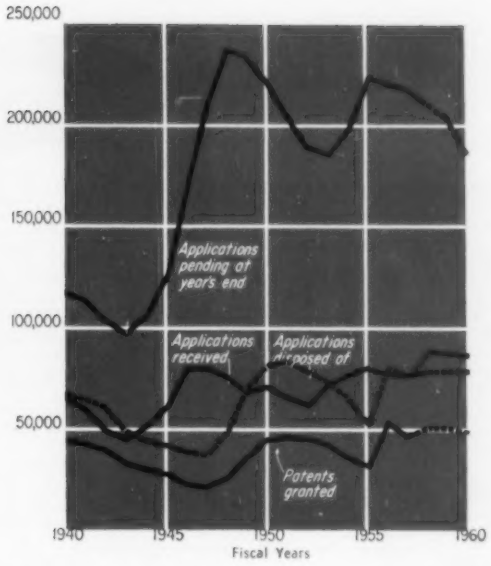
There are several government agencies that can help the inventor who wants to exploit his patent but doesn't know how. The Patent Office itself, although not in a position to give marketing advice, will, for a fee of $3, announce in the *Official Gazette* that the patent is available for license or sale. This *Gazette*, published weekly, is read by a large number of businessmen looking for new products.

Two other divisions of the Department of Commerce can help you bring your invention to the attention of interested manufacturers. The Business and Defense Services Administration maintains close contact with all branches of American industry and may be able to recommend an interested company. The National Inventors Council (Office of Technical Services, Department of Commerce) is concerned with inventions—both patented and otherwise—with defense potentialities. The Council publishes a booklet titled "Inventions Wanted by the Armed Forces" which lists technical problems needing solution.

Department of Commerce Field Offices (there are 31 located in large cities throughout the US) represent the agencies mentioned above (Patent Office, Business and Defense Services Administration, National Inventors Council) and can give some of the same service available in Washington. The amount of help will depend somewhat upon local policy and the availability of similar services from other local organizations. Other groups which should be approached are: Chamber of Commerce or a locally financed industrial development organization, banks, area departments of power companies and railroads. Also, within the state government there is usually a state planning and development agency or a Department of Commerce and Industry that may offer assistance or advice.

Small Business Administration

Probably the Small Business Administration will be the most helpful agency of the federal government. Created in 1953 to assist small business enterprise, SBA now has over 50 offices in major cities of the US. Its Products Assistance Program is intended to make SBA a go-between for patent holder and manufacturer. For example, SBA publishes a *Products List Circular* every month which lists (with sketch and short description) newly patented devices of probable interest to



■ **A staff of about 1000 examiner assistants** can dispose of 90,000 applications per year. That's why Patent Office Officials consider a backlog of 100,000 applications a good working goal. At present, an application may take as much as 38 months between receipt and disposal, but this is not necessarily the fault of the Patent Office. The natural give and take between attorney and examiner takes time. Generally, office processing accounts for about ⅔ of the processing time—the applicant and his attorney the remaining ⅓.

manufacturers. Nationwide circulation is about 15,000. To have your patent listed, just make application to SBA (Form 312). The service is free.

In addition, local SBA offices know when venture capital or unused manufacturing services are available in an area. Engineers on the SBA staff can evaluate ideas, suggest new markets and introduce an invention to a corporation, to the advantage of both manufacturer and patent holder.

This service is free from SBA, but similar services, on a commercial basis, are beginning to appear around the country. Usually working on a percentage of royalties, a few companies have been set up specifically to screen and evaluate ideas for product-hungry manufacturers. Until very recently these services could not be made to pay. But there are indications that the business world will be using them more often in the future.●

■ **An experimental search system,** using a new IBM Ramac, takes advantage of the computer's large random access memory stored on magnetic disks (seen in background behind glass doors). This computer is the most recent acquisition of the Office of Research and Development (US Patent Office) which is conducting a study of methods of storage and retrieval of information in scientific disclosures. Working closely with the National Bureau of Standards, the Patent Office is attempting to put machine searching on an operational basis, at least in certain specified fields. Note that an estimated 60% of the time of patent examiners is spent in the search operation.

POINTS OF

THE QUESTION:

"Should Our Scientific and Engineering Education System be Revised?"

Dr. J E WALLACE STERLING
President Stanford University

"No . . .

if one is referring to our system of education in science and engineering. American education has worked side by side with industry to give this country greater productivity and a far higher standard of living than exists anywhere else on earth. There is no need to panic or to engage in crash programs just because the Russians, after looking at what science and technology have contributed to this nation and to the Western world, have decided that they, too, should concentrate on these fields.

"This is not to say that the education of our scientists and engineers could not be improved. We need greater emphasis on quality. More of our best students should go on to graduate work. We need more centers of advanced training and greater financial provision for research assistantships and graduate students. It is indefensible that only 2% of our engineering students go on for a doctor's degree and only 20% for a master's degree.

"Some modification in the management of the engineering and scientific aspects of our national defense would be beneficial. The spectacular triumphs of Soviet technology were achieved by concentrating men and money on a limited number of objectives and by minimizing government red tape. By doing a better job of management and decision making, Russia has forged ahead of us in ballistic missiles and other fields, even though on the whole our scientists and engineers are probably both better and more numerous than theirs."

Sen LISTER HILL
Chairman, Senate Committee on Labor & Public Welfare

"The Soviets place a premium . . .

upon intellectual excellency with the accompanying demands for devotion to the hard labor of rigorous thought. I agree with this particular Russian emphasis and I believe that our educational focus in this modern age must be similar to Russia's—with an all-concerning difference. As I see it, that difference is two-fold, first, in that we must not and will not regard the man educated and trained as simply a tool for the advancement of the State but as an individual of dignity and worth and possessed of 'certain inalienable rights.'

"Second, I see a difference in that our educational emphasis must not and will not be confined as is Russia's to grinding out scientists and engineers at the expense of other intellectual attainments and disciplines. Education in America reflects the attitude of a whole people and its programs are determined not by the State but by the businessman, the laboring man, the professional man, the parent, and many others. Is our system really so inadequate as some would have us believe? Of course, we have been shaken by Russia's surprising gains in missile and space technology. We need to take another look at our scientific and engineering programs. We have allowed an inbalance to develop in our educational system to the detriment of these programs. We must correct this imbalance; and we will. The National Defense Education Act of 1958 already is at work to help with this correction. Let us admit that we have been off base. But to suggest that our entire educational system has 'struck out' is ridiculous."

VIEW

"We do not have enough . . .

qualified science teachers. This, perhaps, has always been true, but the situation has been most critical during and since World War II. It has been particularly critical in the physical science area. A large proportion of the instruction in science has been by individuals trained for teaching in other fields and who are relatively unqualified to give instruction in science. It is probable that less than half of the highschool science teachers teach science on a full-time basis.

"Although highschool administrators frequently think of science as a homogeneous field, this is, of course, not the case. Adequate training to teach all of the sciences commonly offered in highschool is very difficult to acquire under present four-year college programs. The recent and future increases in student enrollment will probably intensify the demand for science teachers. In addition, recent emphasis on science will probably result in a relatively greater percentage of the student body being enrolled in science courses. Thus, administrators will continue to be faced with the unattractive alternative of dropping science courses or offering them with relatively unqualified instructors. The most basic problem in the improvement of science instruction is how to insure an adequate number of qualified teachers.

"The question might well be asked, 'What is the situation now?' A recent sampling study by the National Education Association showed that approximately 39.6% of the science teachers had 30 or fewer semester hours of science instruction and 5.4% had nine or fewer semester hours. Although semester hours of credit can certainly not be taken as a very satisfactory criterion of teaching capacity, it at least has the virtue of objectivity. Perhaps 30 semester hours of credit might constitute a satisfactory minimum of training if both the teacher's training and the teaching assignment were optimal. The National Education Association report actually places a much too favorable light on the situation. The hours in science may have little relation to the kind of teaching assignment which the teacher has. Thus, it would be possible for a individual to have 30 hours of zoology and be teaching physics. Although this would be an extreme case, there can be no doubt that there are many individual instances in which exactly this sort of situation prevails. There

Dr. HERBERT A SMITH
Chief—Science, Math and Foreign Language Section, Dept. of Health, Education and Welfare, President, National Science Teachers Assn

are studies which show that many "science" teachers do not have an hour of college credit in the particular field in which they are giving instruction.

"Perhaps the main question of concern should be 'What can be done to improve the situation?' It is obvious that the attractiveness of science teaching as a profession must be enhanced. A study in one state has demonstrated that the average 'professional life' of science teachers in that state is just over eight years. This is probably not typical. The profession and the nation cannot stand this kind of attrition in a vital field.

"Some positive suggestion to secure qualified science teachers and to retain them in the field are:
(1) Provide better pay; (2) provide better teaching facilities; (3) provide relief from routine clerical and housekeeping chores; (4) provide laboratory assistants; (5) reduce to a minimum extra-curricular responsibilities; (6) encourage bright young women to study for careers in the teaching of science. Our cultural stereotypes are against the teaching of science by women, particularly the physical sciences. It is time that an active program be undertaken to change this conception; (7) require better pre-service training as a condition of certification; and (8) improve certification laws."

DEANE W MALLOTT
President Cornell University

"The world today is a fast changing place . . .

and man must adjust to this age and conquer it just as he has in previous ages. There is no system, no proceduce, at his command, which he must not constantly examine, constantly revise, in order to make it best serve his needs and interests. This is certainly true of our scientific and engineering systems, even though they have served us well in the past and are serving us well in the present. These systems did not come into being full grown, they grew and changed to achieve their present size and efficiency. To oppose their revision is to be against making them adaptable to new and different conditions. We must be engaged in a constant reappraisal of these systems, and we must make revisions when they are needed.

"Today the pressures for change, radical and rapid, are stronger than at almost any other time in our history. Significant advances in science, engineering and in other areas in recent years, and the emergence of the Soviet Union as a contender for world leadership, have placed increased pressures on us to change and revise. As these pressures mount, there is danger that we might embark on new courses simply for the sake of novelty. We must be alert to this possibility, we must justify the changes that we make, we must be sure that revisions will result in improvements, and that in changing, we achieve, not confusion, but progress."

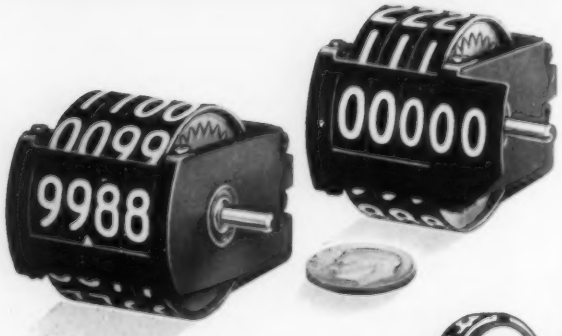
Men who Count KNOW

it pays to give their customers Veeder-Root Counting Precision

If you need ultra-precision counters to build into your product as an added service to your customers, then take a long look at Veeder-Root Instrument-type Counters, like those shown below. You'll see craftsmanship that measures up to ultra-precision standards. And you can count on it that Veeder-Root precision remains a constant quantity under highest speeds and toughest operating conditions.

Veeder-Root can bring to your counting problem the longest experience in precision counter-making of anyone in this business. Give your customers the advantages of built-in counters, give them the lifetime assurance of Veeder-Root precision.

You always "Know the score" when you count on Veeder-Root!



NEW VEEDER-ROOT MINIATURIZED COUNTERS

These Internal Pinion Counters have ⅛" wheels on which the figures are a full ¼" high, combining minimum size with maximum readability. Runs at continuous speeds of 400 rpm, and intermittent speeds of 750 rpm. Torque 1.5 oz. Meets military specifications. Originally built-in parts of navigational instrumentation, these counters are applicable to many other uses.

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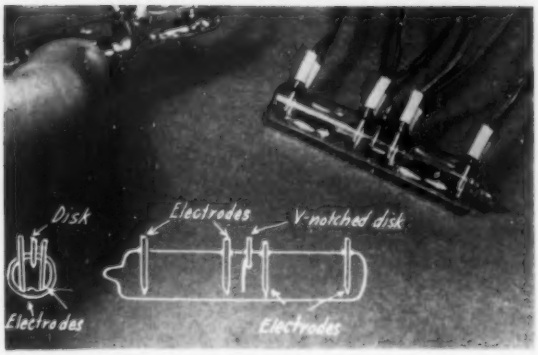
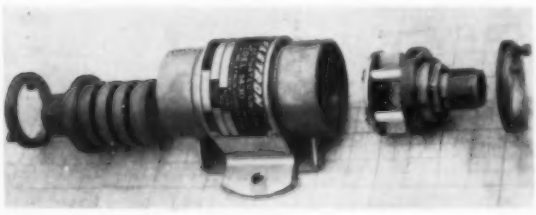
SIGNIFICANT COMPONENTS MATERIALS PROCESSES



One-way mercury switch . . .

controls flow so that momentary wipe contact is produced when tilted 10° or more in one direction. When actuated, mercury piles up at notch and contacts two electrodes, placed next to gate or orifice disk with V-notch in bottom. Feed-through on return is too small to touch contacts. Using this basic orifice principle and inserting additional electrodes makes possible a variety of circuit arrangements. Standard-size switch measures less than 2¾ in. long, less than ½ in. dia. Weighs 0.7 oz. It is said to be capable of carrying 5 amp at 115 v, with inrush overloads of up to 10 amp. Operating capacities of up to 100 amp and inrush overloads to 500 amp may be handled, at temperatures up to 250 F. Hermetically sealed units may be used for machine tools and similar electrically operated devices. Average list price is $2; available from stock. **American Designed Components Inc, Jericho, NY.**

Circle 101, Reader Service Card



All-metal machined switch . . .

has tier-tube pressure capsule and snap-action switch element. Eliminates all O-rings and nonmetal parts subject to aging and deterioration. Said to be leakproof, shockproof and to function indefinitely. Pressure-actuated switch is basically a machined bellows with line pressure applied to inside. Face of bellows acts against snap-action switch. Machining is reported to attain higher linearity and repeatability than can be obtained with formed bellows. Pressure element varies in wall thickness to suit pressure ranges of specific applications. Said to have high temperature-stability, contact pressure and sensitivity. Units are available for use in −300 to 750 F. Nominal pricing, depending on quantity and function ranges from about $55 to $75. Normal delivery about 30 days. **Meletron Corp, 950 N Highland Ave, Los Angeles.**

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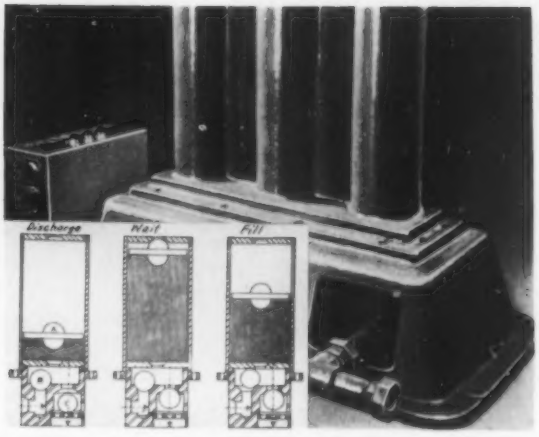

Air-operated free-piston pump . . .

is said to operate indefinitely without efficiency loss and to be capable of handling any substance that will flow. Pump has no moving parts such as motor or engine, drive shaft or belt, packing or seals, oils or grease, yet provides 100% displacement of anything from molten metals, at up to 2000 F, to ice cream. Three chambers fill by gravity or power and are emptied in overlapping sequence by force of air under pressure. Air charge is automatically switched from one chamber to another by timing-control system that provides uninterrupted, air-free flow. Each chamber is lined with stainless steel and comprises a top plate, a replaceable cylinder sleeve and an inlet-outlet base unit. Free-floating nylon piston in each cylinder floats on charge to eliminate turbulence and minimize air absorption. Piston also seals compressed air from base unit, which contains two nylon ball check valves. Current model is 45 x 24 x 53 in. high. Capacity (water) is about 100 gpm and can be varied by changing air pressure and inlet-outlet sizes. Unit shown weighs about 1000 lb, with cast iron jacket and base. Price, about $2000. Control box, electrically-operated, can be installed any distance from pump. Delivery on standard models, 5 to 1000 gpm and over, is 4 to 6 wk. **Crossley Machine Co, 301 Monmouth St, Trenton, NJ.**

Circle 103, Reader Service Card

Silicone rubber compounds . . .

said to be easier to process have been added to the Silastic line for general-purpose, wire and cable insulation, and fuel and oil-resistant uses. Materials are all offered in catalyzed and unvulcanized forms. Can be color-coded to most shades. General-purpose compounds and Silastic 1602, for wire and cable insulation, release from mill rolls without use of scraper blades. Another stock for wire and cable insulation, Silastic 1601, is packaged for direct feeding to extruders. Fuel, solvent and oil resistant fluorosilicone rubber, Silastic LS-63U, can be fabricated by molding, extrusion, calendering and dispersion coating methods. Said to be serviceable at temperatures between −85 and 572 F and to exhibit low-volume swell and

(CONTINUED ON PAGE 44)

PUMPS

that offer a new approach to your design problems

BUILT-IN DIRECTIONAL CONTROL

Miniaturized in everything but power, Oil-Dyne pumps provide new economy and efficiency on standard hydraulic applications . . . make hydraulic actuation possible on applications never before feasible.

Oil-Dyne pumps simplify your design problems by eliminating external directional control valving . . . integral valving permits changing the direction of cylinder travel by simply reversing the motor. Pressures to 3,000 lbs. (5,000 lb. peaks); available with or without pressure switches and/or relief valves. Write for illustrated catalog.

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SIGNIFICANT COMPONENTS MATERIALS PROCESSES . . .

(CONTINUED FROM PAGE 43)

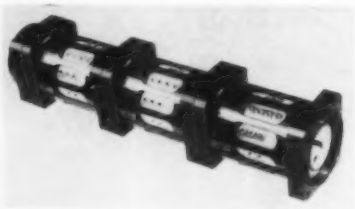
little physical property change when immersed in jet fuels and hydraulic oils. Tensile strength is 1050 psi. Prices start at $16 per lb. Announcement has also been made of a master batch stock containing 80% silicone polymer and 20% reinforcing silica. Can be compounded to produce a number of easily-handled heat-stable silicone rubber stocks. Accepts large quantities of reinforcing fillers, permitting compounds of up to 80 durometer to be formulated. Can be molded, calendered or extruded. **Dow Corning Corp, Midland, Mich.**

Circle 104, Reader Service Card

Infrared controller . . .

is sensitive over a range of 250 to 1000 F to radiation emitted by target. Like previous models, optical device requires no contact. Operates from 6 in. to many feet away, without touching work. It has angular cone of vision of 5° and can be used for detection and control of small or moving objects and, therefore, for counting or initiating a process when work passes a given point. Repetitive accuracy is said to be better than ½ of 1% of scale. Said to be fast, with millisec response time. Wide-aperture optical system, special photoelectric cells and high-gain amplifier provide stable operation and control even with fluctuations in line voltage. Furnishes control action through internal relay that can handle 5 amp at 115 v. Two power outlets are furnished for control action on make or break. Relay action is on-off. Electronic relay can shut off heater, sound alarm or perform other tasks. Standard operating range is 950 to 2000 F. **Mason Instrument Co, 29 Elm Ave, Mt Vernon, NY.**

Circle 105, Reader Service Card



Shaft-to-digital converter . . .

can pulse data-processing equipment directly, without intermediate relay matrix. Heavy current output eliminates need for numerous relays in banks, and unit thus reduces space requirements, installation costs and maintenance costs of encoding systems. Device is bidirectional, electromechanical converter that translates mechanical position into decimal digital code, providing nonambiguous readout for any shaft position. May be used as part of digital voltmeter system. Has 500-mil output for card punch and similar equipment and output of ½ to 1 mil for neon lamps or Nixie tubes and displays. Max slewing speed is 1500 rpm, with each revolution providing 10 counts. Readout accuracy is said to be better than ½ digit least increment. Unit employs 10:1 stepdown gearing between decades, any number of which may be provided. Solenoid provides power and intelligence to actuate next stage. With shaft dia of 3/16 in., torque of 0.5 in.-oz max friction breakout is required for 3-decade unit. Current capacity is 0.5 amp max. **United Precisioneers Inc, 23916 Craftsman Rd, Calabasas, Calif.**

Circle 106, Reader Service Card

Miniature transducer . . .

is oil-damped to withstand use in rocket engine test environments. Withstands pressure transients generated in shock tubes or transmitted from firing chambers and retains high natural frequency of undamped miniature flush-diaphragm instruments. Reported to measure pressures from 0 to 50 and 0 to 1000 psi with operational, environmental and service life advantages of unbonded strain-gage transducers. Case is 49/64 in. long and 1 in. wide between hexagonal sides. Weighs about 3 oz. Output is about 28 milliv full scale open circuit at 7 v ac or dc excitation. Nonlinearity and hysteresis are said to be not more than 1% of full scale. **Statham Instruments Inc, 12401 W Olympic Blvd, Los Angeles 64.**

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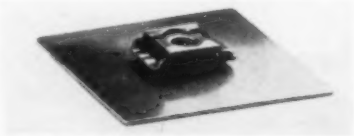

Expansion nut . . .

is quick-attachment fastener for multipurpose use where tapped holes are needed in thin sheetmetal assemblies used in appliance, automotive and allied fields. Available in six standard thread sizes, from ¼-20 to ⅜-24, and can be used in hand– or production-fastening operations. Assembly consists of nut held in sheetmetal retainer having performed tabs that fit into prepierced square hole of panel. Arched bars at each end of retainer are straightened by special tool to lock nut in place after insertion in tapped hole. Action also opens retainer sufficiently to permit nut to float for alignment. Can be attached to panel without having to support panel. Tool can be operated manually, electrically or pneumatically. **McLaughlin Co, 212 Jaikins Bldg, Birmingham, Mich.**

Circle 108, Reader Service Card

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The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

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To design machine parts, assemblies, or complete machines, working in conjunction with a Research Engineer or Development Engineer. Must have imagination, and enjoy working on a drawing board. Must be able to supervise erectors or other assistants, and conduct laboratory or field trials of machinery designed.

Must be graduate Mechanical Engineer, with at least 5 years experience in the machine design field. Experience with textile machinery helpful, but not essential. South Carolina location.

Positions available for those who can qualify by experience and interest about August 1, with interviews being held during July.

Write, giving full information of educational background, work experience, and earnings, as well as personal information of interest.

All replies will be held confidential.

Our employees know about this ad.

Address P-2016, Product Engineering Class. Adv. Div., P. O. Box 12, N. Y. 36, N. Y.

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For Pneumatic Precision Controls

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- Professional status
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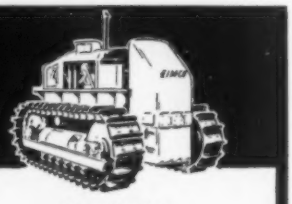

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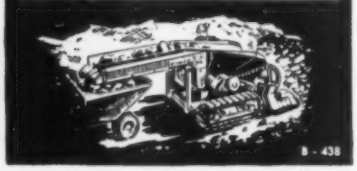

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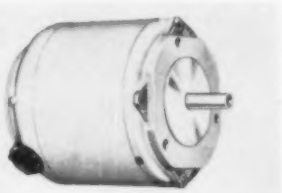

Synchronous motor . . .

is instantly started, stopped and reversed by SP-3 position switch because motor has three leads only. No additional starting means or electrical or mechanical braking are needed. At 60 cps, speed remains at 72 rpm without gear reduction. Torque is rated at 150 in.-oz. When used as stepping or inching motor, dc impulses are converted into 200 or 400 precise increments of 1 revolution of motor shaft. Rated torque is said to be maintained for any stepping position and each step is made without slip or clatter. Excessive inrush current is avoided because starting and operating current are nearly identical. Rated input is 120 v, 40 or 70 cps, 1 phase and current is 0.3 amp max at 60 cps. Measures 4¼ in. dia x 4¾ in. deep; weighs 6.5 lb. Models having integrally mounted resistor and capacitor and speed-reducing planetary gear assemblies are also available. **Superior Electric Co, Dept SS, Bristol, Conn.**

Circle 109, Reader Service Card

Prototype service . . .

for aluminum casting jobs offers one-shot procurement program. All stages of manufacture are accomplished under one roof, including design and building of casting tools, casting of unit, heat treating, and precision machining to finish dimensions. Extremely thin high-strength sections with fillets and fine surface finish are reported to be consistently held. **Brown Engineering Service Co, 29675 Lakeland Blvd, Wickliffe, Ohio.**

Circle 110, Reader Service Card

Epoxy adhesive kit . . .

permits prospective users to evaluate a complete range of resins and hardeners at a cost less than 1 gal. of clear resin. Includes 2 clear resins, 1 filled resin, 2 one-component systems, 1 epoxy-patch kit No. 1C and five hardeners, selected for varying viscosities, pot life, cure and resiliency. Available from stock for $12.95, FOB shipping point. **Houghton Laboratories, Olean, NY.**

Circle 111, Reader Service Card

motors for commercial applications

HIGHEST TORQUE FOR SMALLEST SPACES

Missile designers are well acquainted with the extremely high torque available from a planetary geared precision miniature Globe motor. Units similar to the one pictured can produce up to 150 inch pounds of torque!

And more and more designers are finding that these motors offer outstanding advantages for commercial applications as well. Universal, a.c., or d.c. types are available from 7/8" to 2 1/4" in diameter. They can replace larger, ordinary motors at competitive cost, and deliver important bonuses too. They perform reliably under conditions that would soon ruin ordinary motors—high humidity and temperature, jarring shock and vibration, dust and fume-laden atmospheres.

Globe speed reduced motors are engineered to fit your specific application as no "off the shelf" motor can. Standard component design is the secret; for example, 83 even ratio planetary reducers are available to give the speed and torque you need. Many parts are inventoried. Design and production efficiency will save you money. If you have a commercial application that demands a smaller, more powerful, more reliable and competitively priced motor, then consult Globe first. Write for Bulletin ACG. Globe Industries, Inc., 1784 Stanley Avenue, Dayton 4, Ohio.

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PRECISION MINIATURE A.C. & D.C. MOTORS, ACTUATORS, TIMERS, GYROS, STEPPERS, BLOWERS, MOTORIZED DEVICES

GLOBE

NEW LITERATURE

Four More on Technical Writing

TYLER G HICKS, Successful Technical Writing. McGraw-Hill Book Co Inc, 330 W 42nd St, New York 36. 5½ x 8, 294 pp. $5.50.

J N ULMAN JR and J R GOULD, Technical Reporting (revised). Henry Holt & Co, 383 Madison Ave, New York 17. 6½ x 9, 382 pp. $7.

J W GODFREY and G PARR, The Technical Writer. John Wiley & Sons Inc, 440 4th Ave, New York 16. 5½ x 8½, 340 pp. $8.50.

1958 Proceedings of Institute in Technical and Industrial Communications. Colorado State University, Fort Collins, Col. 8¼ x 11, spiral-bound, 128 pp. $5.

The latest crop of books on technical writing includes three of the standard kind, and a fourth that's quite different—in format as well as in much of its contents.

Reading the fourth—the Proceedings published by Colorado State U—is the equivalent of taking a seminar. It's the lectures given at the first annual institute of the kind given at that university. Though it has considerable how-to, it does not bog you down in rules of writing. More important, it serves as a mind-stretcher because the capable instructors cover so many significant topics.

For example, the first lecture, by Melvin Brorby, a successful advertising man with wide-ranging interests, is "The Humanist and Scientist Should Make a Deal." Another alert mind, H E Marschalk, head of Publications Branch, Bureau of Ordnance, U S Navy, offers the thesis that good technical documentation is important to national survival. He gives examples of planes crashing and of Navy troubles arising from sloppy English and sloppy sketches. Concerning a book about land mines, he comments, "I visualized myself trying to use this book out in the field, and I had imaginings of blown-off hands, feet and so forth . . ." Still another of the 17 lecturers, J Leroy Thompson, head of Dow Jones' Educational Service Bureau, explains the philosophy and *modus operandi* of the *Wall Street Journal*, and why that newspaper is so easily readable even when it reports on complex technology.

Concerning the three standard books listed above, all obviously are aimed at that specialist, the so-called "technical writer." Mr. Hicks' book has considerable how-to and is written in a peppy style. The other two textbooks are more professorial in approach. One is a revised edition of an older book by Ulman and Gould. *The Technical Writer* is a British product providing more than the usual amount of information about visual presentation and printing processes.

MAGNETIC RECORDING TAPE—Booklet, 12 pp. Summarizes initial findings of study relating film properties to tape performance characteristics. Includes charts, graphs, performance curves. Du Pont Co, Wilmington 98, Del.

Circle 120, Reader Service Card

ENVIRONMENTAL FACILITIES—Brochure, 31 pp. Discusses capabilities for isolation and reproduction of variety of environmental characteristics. Can reproduce such conditions as vibration, varying temperatures and altitudes, humidity, tension and compression, shock, acoustics, acceleration, pressure. General Electric Co, 3198 Chestnut St, Philadelphia 4.

Circle 121, Reader Service Card

POLYMER PRODUCTS—Directory, 8 pp. Specific properties and applications of line of polyvinyl acetate emulsions and solutions, styrene-butadiene emulsions, acrylic emulsions and solutions, polystyrene emulsions, sodium polyacrylate thickeners, polyvinyl alcohols, and polyvinyl acetate bead resins. Borden Chemical Co, 350 Madison Ave, New York 17.

Circle 122, Reader Service Card

CARBON STEEL SPECIFICATIONS—Chart Sec E, No. 1. Shows chemical analysis requirements for 60 most frequently used military and federal specs. Also listed are specified forms and nearest corresponding SAE, AISI and AMS type numbers. Peter A Frasse & Co, Inc, 17 Grand St, New York 13.

Circle 123, Reader Service Card

TIME ZONE MAP—Clearly outlines five standard time zones of US and Canada. Time differentials are shown on clockface in each zone. Also available is a chart showing direct distance dialing telephone codes throughout US and southern Canada. Includes map outlining coded areas and instructions. Ohio Seamless Tube Div, Copperweld Steel Co, Shelby, Ohio.

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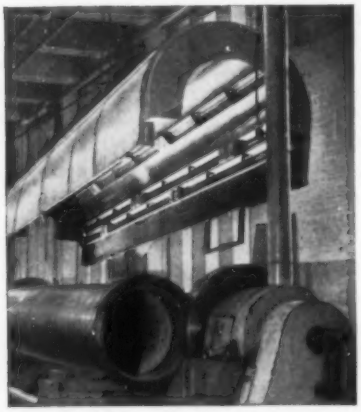
San Francisco 4 . . . W. C. Woolston, 68 Post St., Douglas 2-4600

HOW CHROMALOX ELECTRIC HEAT
helps make it... and make it work

...the U.S. Navy's new Mark 32 fibre-glass torpedo launcher

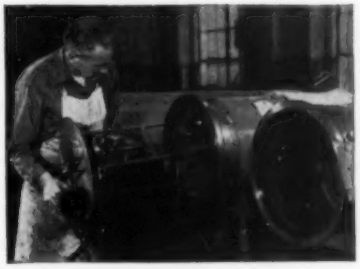
From its unlikely beginning as a fibre-glass mat . . . to its successful operation in sub-freezing sea spray . . . the Mark 32 torpedo launcher testifies to the versatility and dependability of Chromalox electric heat. Designed and built by Apex Reinforced Plastics, division of White Sewing Machine Corp., this lightweight, corrosion-resistant launcher is now in service on Navy destroyer escorts.

In early production stages, a Chromalox-heated hood is used in centrifugal molding of the launcher tubes.



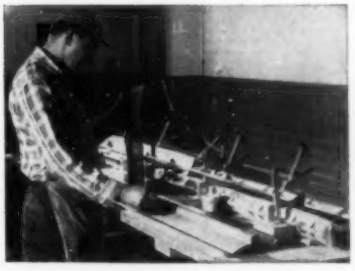
First, a rolled fibre-glass mat is placed inside the mandrel, which is then engaged in spinning motion at 800 rpm. After thermosetting resin has been sprayed into the mandrel, the hood is lowered into position for heat curing. The Chromalox type RAD Far-Infrared Heaters have a total capacity of 36,600 watts, and work reaches approximately 200°F. in about 45 minutes. The hood remains on a total of about 3½ hours, throughout the spinning operation.

Before final assembly, each tube must have steel "nut bars" and "guide bars" cemented to its interior. (Nut bars connect the three tubes into one assembly; guide bars guide torpedoes into each launcher tube.) After these parts have been cemented in place, two Chromalox Tubular Heaters wired in series are used to set the cement.



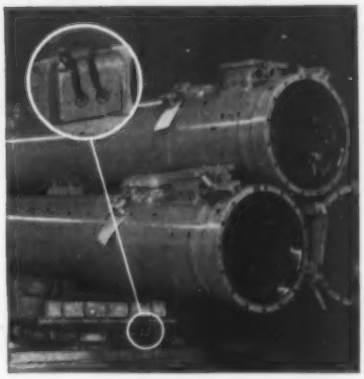
Mounted in a frame which holds them in the center of the tube for its entire length, the 240-volt, 2750-watt heaters are controlled by a Chromalox type AR Thermostat. A small fan attached to the end cap circulates heat within the tube and eliminates condensation during the drying operation.

Next, four plastic quadrants are bolted to the tube interior, forming a liner to accommodate 12¾-inch torpedoes. To each quadrant are affixed two 101-inch Chromalox Flexible Woven Heaters shown below being cemented



in place. After resin has been applied to the two channels in each quadrant, heaters are laid in place. The leads are then connected to a power outlet and the heaters set the cement which bonds them in place. In action, these heaters maintain a protective 50°F. minimum temperature for the torpedo.

The closeup below shows two leads of a circular Chromalox Tubular Heater clamped in a groove around the launcher's swivel base. To prevent formation of ice in the joint between fixed and rotating parts of the base, this heater comes on automatically when the temperature drops below 50°F.



Perhaps one of these heaters, or one of the 15,000 other types, sizes and ratings of Chromalox Heaters can answer your need for heat. For personal assistance and specific recommendations, *call your Chromalox Man for the Answers.* He's listed below.

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Buffalo, N. Y. SUmmer 4000
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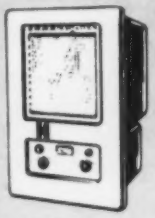

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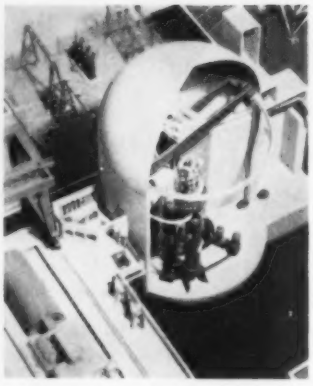


Build-your-own reactor

An atomic power kit, a nuclear sub, and a missile-firing submarine "complete in every detail"—though minus the uranium, we would expect—will be ready for distribution to young engineers this fall. The power plant, a model of the Westinghouse-built Shippingport reactor, will be accompanied by an informative booklet, *The New World of Atomic Power*, written by Dr. W. E. Shoupp of Westinghouse. The reactor is built on a scale of 1/192, and is designed for mounting on an 18-by-18-in. board. Expected retail price is $6.95. Revell Inc, is the manufacturer.

Revising an ancient art

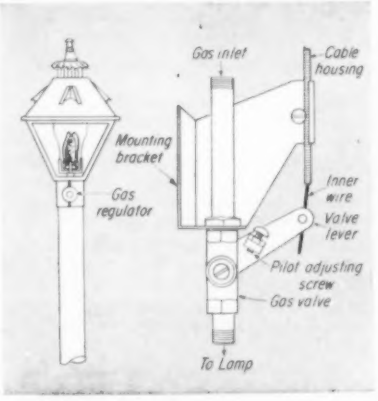
Bread-baking has been mechanized; but its basic steps have changed hardly at all since ancient times. First the dough is mixed, then proofed (allowed to set for about 20 minutes before fermentation), after which yeast is added and the dough fermented. Next the dough is separated into portions, molded into loaves and, finally, baked.

Now, the Navy has stepped forward to eliminate two steps completely—with their associated equipment. Both proofing and molding stages can be dispensed with, says the US Navy Supply R & D Facility, if dough temperature, yeast content, shortening and dry nonfat milk solids are somewhat increased—with water, sugar, and salt decreased.

Progress? Navy's report does not comment on taste.

Now they're remote-controlled

Latest thing in gas lights, now staging a "comeback" (*PE—FYI, Nov 17 '58*), is a simple install-it-yourself system that makes it possible to turn the gas in your street light up, down, or off from inside the house. It consists of a gem box and control knob with a cable leading to a valve installed in the service pipe. A pilot light and adjusting lever ((see diagram) do the rest. Tragesser Copper Works, Inc, Jamaica 30, NY, makes both lamp and control.



Why Don't They

RESEARCH and DEVELOP . . .

. . . a valve cap for automobile tires that would show at a glance when pressure was at the preset level. Must be simple and inexpensive—a set of four costing not more than a dollar at service stations and auto supply stores. It could be marketed in a variety of preset levels covering the full range of common tire pressures in 2-psi intervals. It would also be desirable if it indicated overpressure as well as underpressure.

Must be rugged and reliable to withstand repeated shocks, vibration and large centrifugal forces. Perhaps a simple diaphragm balanced by a small chamber of inert gas in the top of the cap would do the trick. When pressure was at the correct level, a bright eyecatching indicator mark would show through the transparent sides of the plastic cap.–G. Wenke

. . . more mechanized equipment for the meat-packing industry. The American Meat Institute, national trade association of 350 meat packing and sausage manufacturing companies, has recently published a small booklet outlining needs of this industry for more automatic machinery. "The industry," says the booklet, "is entering a period of mechanical revolution which is opening up many opportunities for imaginative machinery manufacturers and engineers."

The Institute's Committee on Engineering and Experimentation has come up with a list of 32 operations where automatic machinery could replace functions now performed at least partially by hand. These include: a mechanical knife for shaving hogs on the killing floor; an automatic device for sawing bone in frozen steaks without leaving grease or bone dust; an electronic device for locating internal bruises; an improved weighing and marking device for catch-weight packaged products; a continuous casing-forming and stuffing machine for stuffing skinless franks (similar to present Kartridg-Pak Chub machine); an economical noncorrosive, noncontaminating substitute for stainless steel; an automatic work loin wrapping and grading machine; an automatic brander for smoked meats; a high-speed patty forming device which would interleave paper and put patties directly into the shipping container; a device to automatically detect minute quantities of mineral oil or animal fats in 200 F condensate.

For further information, write: D. S. MacKenzie, director, American Meat Institute, 59 E Van Buren St, Chicago 5.

Have you a problem, based on known scientific principles, which seems to have an answer somewhere within the limits of present technology? To inspire inventors along worth-while paths, PRODUCT ENGINEERING invites you to trade such problems with fellow readers who may have a fresh viewpoint or more time for necessary R & D. We will pay $10 for each once accepted.

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102	107	112	117	122	127	132	137	142	147
103	108	113	118	123	128	133	138	143	148
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5	12	19	26	33	40	47	54	61	68	75	82	89	96	
6	13	20	27	34	41	48	55	62	69	76	83	90	97	
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Publisher's Postscript...

Who pays for your dinner?

Today the fashion in historical novels might be called biographical fiction. The author substitutes imagination for research and action for character. He sells the result to Hollywood and the paperbacks have a picnic. I just finished one about Cleopatra. It was dull.

But I'm half way through a real biography—and it's a "thriller." It's the biography of a design engineer—Charles Franklin Kettering—published two years ago. *Professional Amateur* is exciting reading because it is the story of a man who lived in our time but whose thinking was well ahead of our time.

Kettering quotes are likely to find their way into this column frequently. For example, he once said, "Remember that you and I get no place in the world except in proportion as we serve the fellow who pays for our dinner."

As far as we're concerned this is where you come in.

Sure, the advertisers' dollars pay most of our bills—but the advertiser pays for readers, not printing or paper. So fundamentally, our readers "pay for our dinner."

When Kettering was asked what he would do if he went broke, he replied, "I would create something people want, something they need, and would pay money for."

So a most important part of our publishing job is to find out what the reader wants. It is not too difficult to sit in an ivory tower and decide what he *needs*—but *wants* are different.

Since the latter part of 1953, we have been checking with you consistently to find out what you like and want in PRODUCT ENGINEERING. In regular mail studies and personal interviews, more than 8,000 subscribers have told us what they like and why. We expect to interview at least another 1,000 during the next twelve months.

When the interviewer calls for an appointment, we hope you will have the time to see him or her. The information you give comes back to us for thoughtful consideration and action, too.

Incidentally, if you've got some ideas about engineers or the publications they read, and you'd like to get them off your chest, write us a note. Or just write "interview" on the Readers Service card on this page. Perhaps I can steer an editor to you in the near future. —SJA

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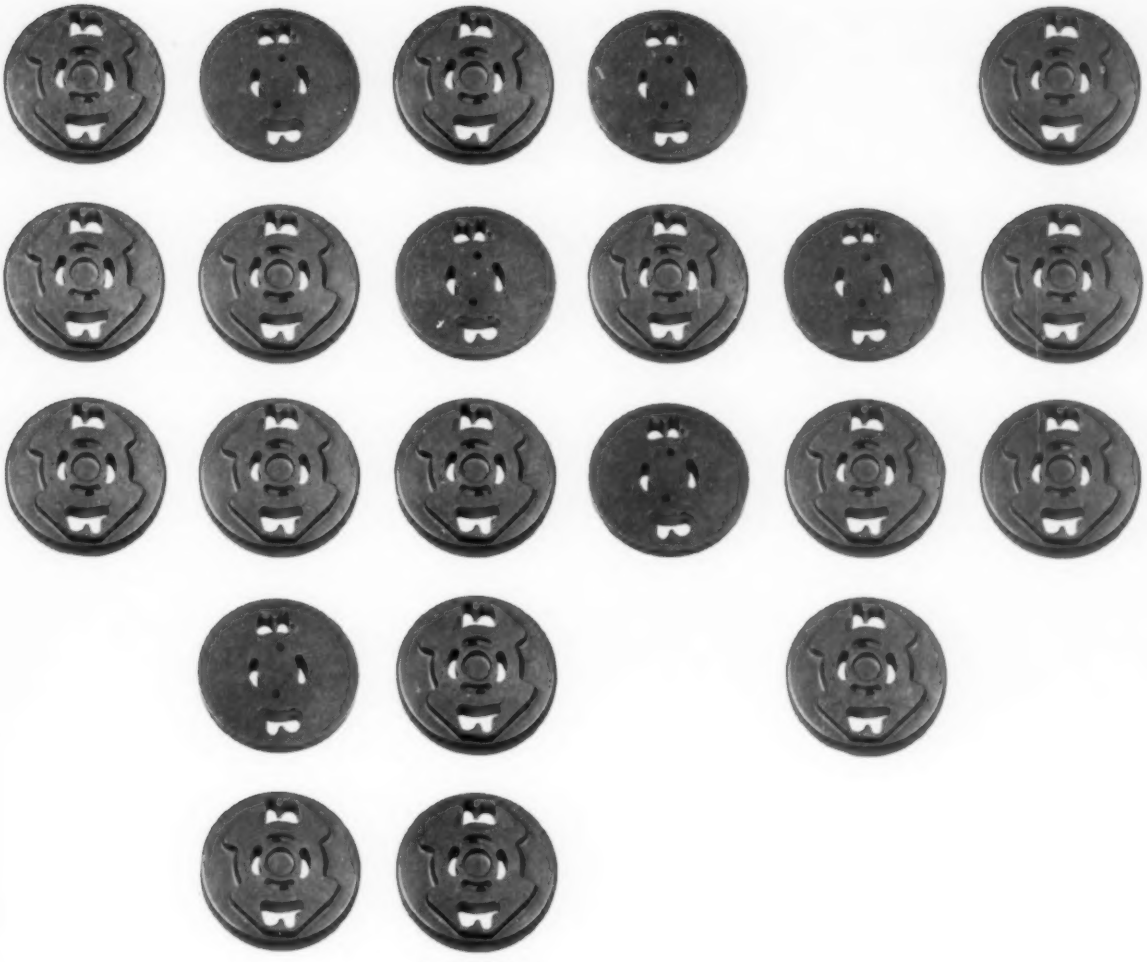

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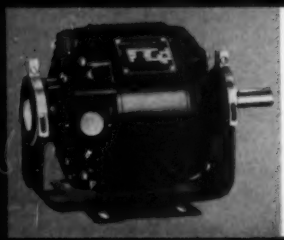

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